The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 5 CHICAGO February 26, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor
L. R. Croy, Assistant Editor

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager
101 West 41st Street, New York City

G. J. Nelson, Western Representative

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

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W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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BUCYRUS

THIS is the time to make your decision regarding improvements and replacements. Go over your excavating equipment carefully and see what should be replaced or where additional equipment—labor-saving devices—should be installed in order to increase your output economically and meet the severe competition that is sure to come with the opening of the season.

Bucyrus shovels that are especially designed for quarry work, have a range in size from the 14-B 2/3-yd. machine to the 110-C. R. R. type with a 6-yd. dipper. Whether your pit is wet or dry, large or small, there is a Bucyrus dragline excavator to suit your requirements. The 30-B 1-yd. revolving shovel illustrated below can be readily converted into a clam shell excavator, a crane, a dragline excavator or a sewer shovel. There are few conditions under which it cannot be employed efficiently, and it may be converted from one type to the other in the field.

Its efficiency as a dragline excavator in the sand and gravel pit is beyond all question. There are no tracks to lay, no wear and tear on cars and locomotives, no pumping and no fear of delay due to flooded pits.

Bucyrus dragline excavators built in all sizes, with booms from 40 to 155 ft.

Send for Bulletin G. P.

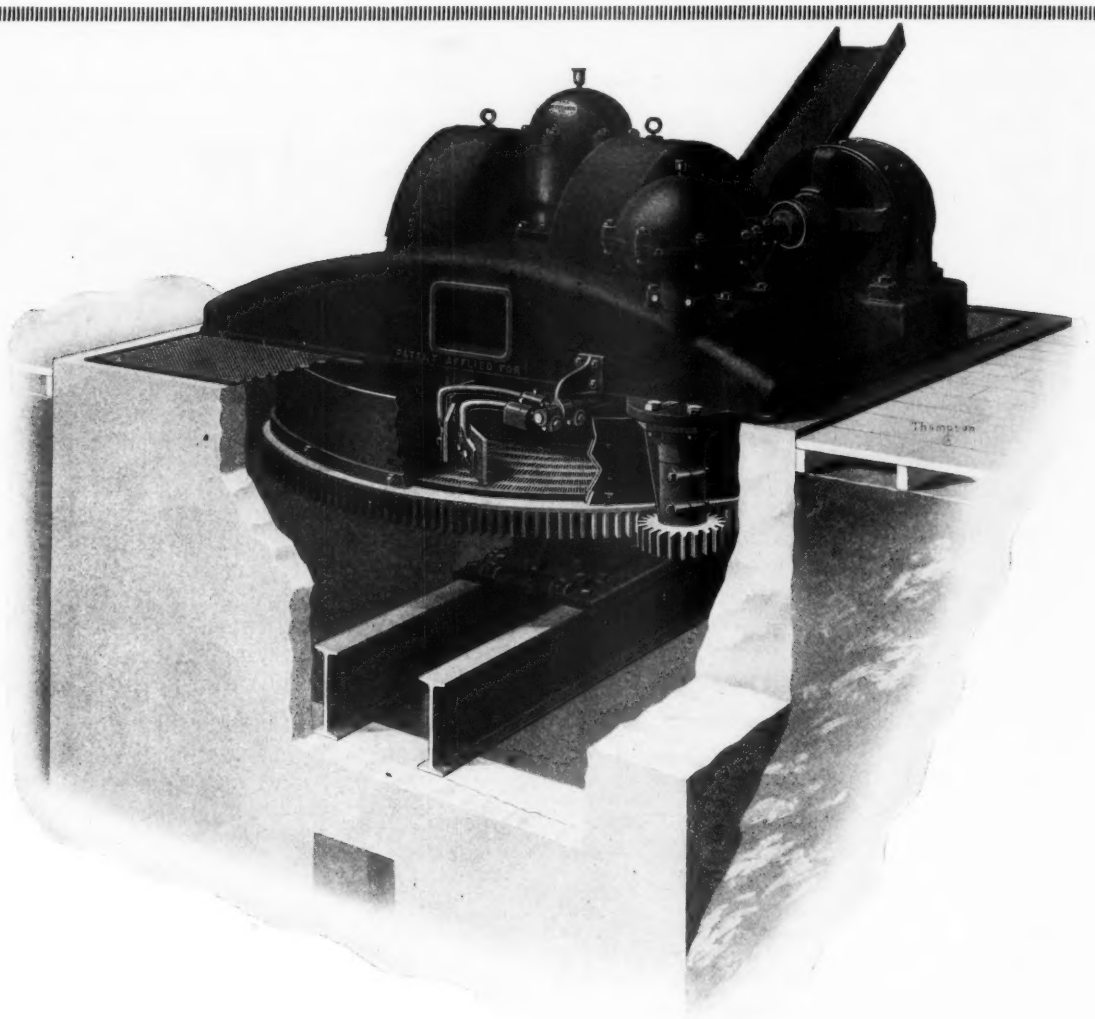
No. 310

Bucyrus Company

South Milwaukee, Wis.

BRANCH OFFICES:

New York	Richmond	Portland, Ore.
Chicago	Birmingham	San Francisco
Cleveland	Minneapolis	Salt Lake City
Pittsburgh	Denver	London, England



Stevenson Grinding Pan

If you have followed the arguments in the editorial column of ROCK PRODUCTS, you will remember it is agreed among authorities that for general use farm lime should be a mixture of fine and coarse, but not above 4 mesh.

This being a recognized fact, why not use the machine that produces the material as required, and a Stevenson Grinding Pan will do it.

It is also adapted for clay or any other product.

Send for Literature

The Stevenson Company

General Offices and Works—Wellsville, Ohio

Engineering and Western Sales Offices—Monadnock Bldg., Chicago, Illinois

MITCHELL ELECTRIC VIBRATING SCREENS
Recover 300,000 tons Crushed Rock Previously Wasted Every Season

One of the most remarkable tributes ever paid any piece of mechanism is contained in the following letter from the Michigan Limestone & Chemical Co. With the exception of the bold face type for emphasis we quote the letter verbatim:

Referring to your letter of January 10th, in regard to our recent order for twenty-one screens, I beg to advise that authority for this order was given only after we had made exhaustive tests with the one screen which we ordered from you early last year.

We have determined after these exhaustive tests with your screen that we could screen and size our product below 1½" size stone much more efficiently with your screen than we could obtain with the 5x20 Trommel Screens which we were using.

In addition we can recover sufficient stone down to 1/16" size with your screen, where our previous best results obtained with the Trommel Screen was down to ¼" in size.

This alone will permit us to **recover** approximately **three hundred thousand tons of stone in a season** from ¼" to 1/16" in size **which we had previously wasted.**

With the new Mitchell Screen plan in operation we also anticipate a considerable reduction in power consumption over that used in the Trommel Screen plan.

In summing up, I might add that the purchase of the twenty-one screens was entirely made on account of the splendid work done by the experimental screen operated last season.

Very truly yours,

MICHIGAN LIMESTONE & CHEMICAL COMPANY,

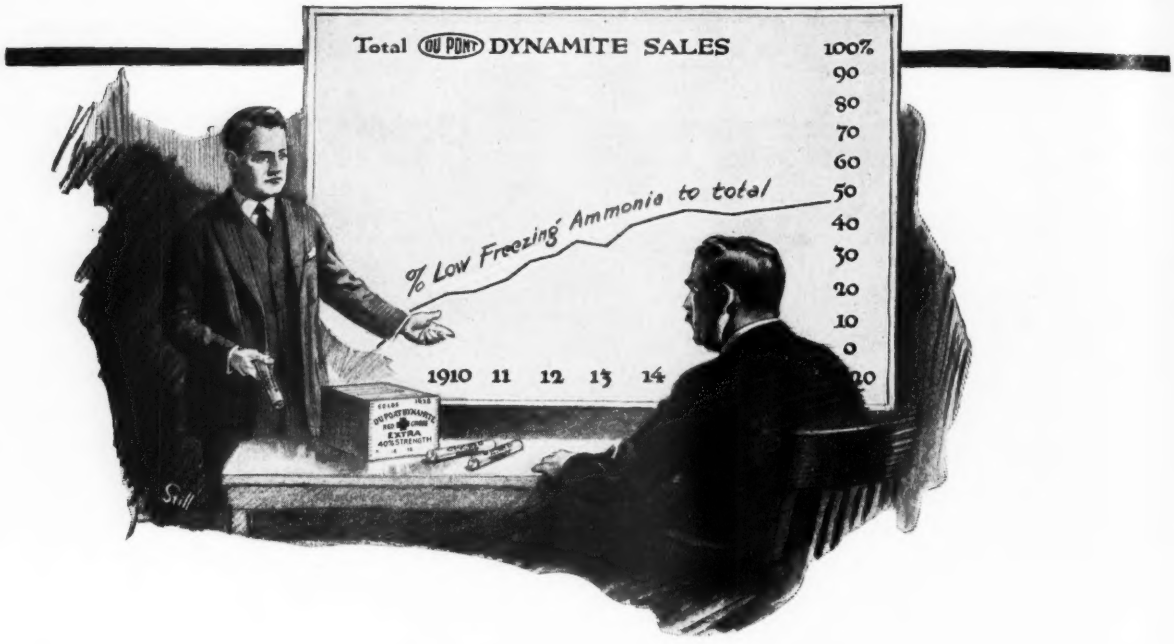
(Signed) CARL D. BRADLEY,
President and General Manager.

We are constantly accumulating data similar to this pertaining to a variety of industries. We urge you to write us, giving your screening problem, and we shall be glad to give you complete information as to what you may expect from the Mitchell.

The Stimpson Equipment Co.

Manufacturers and Sole Agents

315 Felt Building **Salt Lake City, Utah**



FIRST in the Development of Lower-Cost Explosives

THE history of the Explosives Industry will show that this company has always been a leader in the production of powders that will do the work at a great saving over those formerly used. Our introduction of Low-Freezing Ammonia Dynamites in 1907 was a long step in this direction. Explosives users were quick to appreciate the value of this low-cost powder. Its sales increased from 20,000 lbs. in 1907 to 45,000,000 lbs. in 1919.

The saving to Du Pont customers alone amounts to over $350,000 per year.

It is such work as this that causes so many of the country's greatest mining and engineering concerns, year after year, to place in our hands the entire fulfilling of their explosives requirements. For no one questions the day-in-and-day-out uniformity of Du Pont quality.

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Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
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Kansas City, Mo.
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Pittsburgh, Pa.
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St. Louis, Mo.
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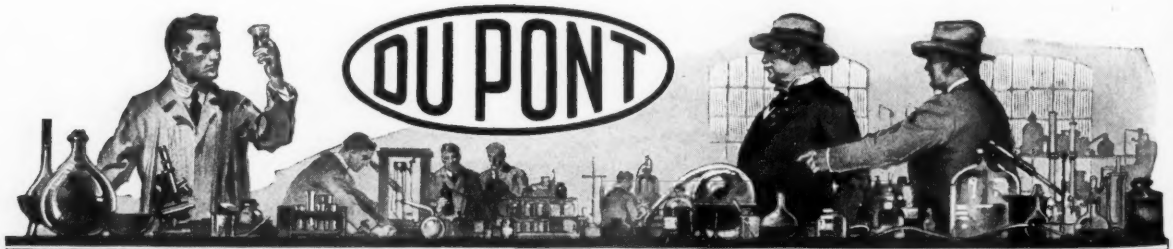
Scranton, Pa.
Seattle, Wash.
Spokane, Wash.
Springfield, Ill.

Du Pont Products Exhibit
Atlantic City, N. J.

E. I. DU PONT DE NEMOURS & CO., Inc.
Sales Department: Explosives Division
WILMINGTON, DELAWARE



EXPLOSIVES ~ SERVICE

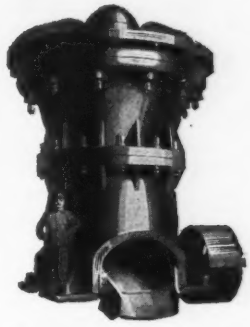
Profit by the experience of these large operators

LEADING cement manufacturers after installing a trial outfit of Worthington crushing and grinding machinery were so well satisfied with the work done and the economies effected that they multiplied their original orders—erected whole plants around Worthington machinery built at the Worthington Power and Mining Works, Cudahy, Wisconsin.

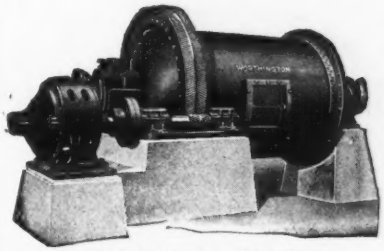
Machinery ordered and in use by these concerns includes Superior McCully gyratory crushers, jaw crushers, rolls, ball and tube mills, conveying machinery and gas engines.

The eastern Worthington works specialize in building pumps, compressors, condensers, heavy oil engines, water wheels, and a complete line of power plant pumping apparatus.

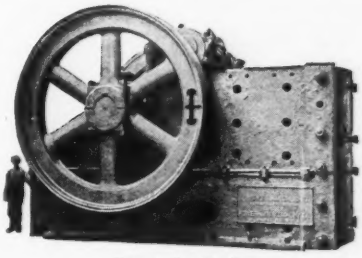
WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
Branch Offices in 24 Large Cities



Superior McCully Gyratory Crusher

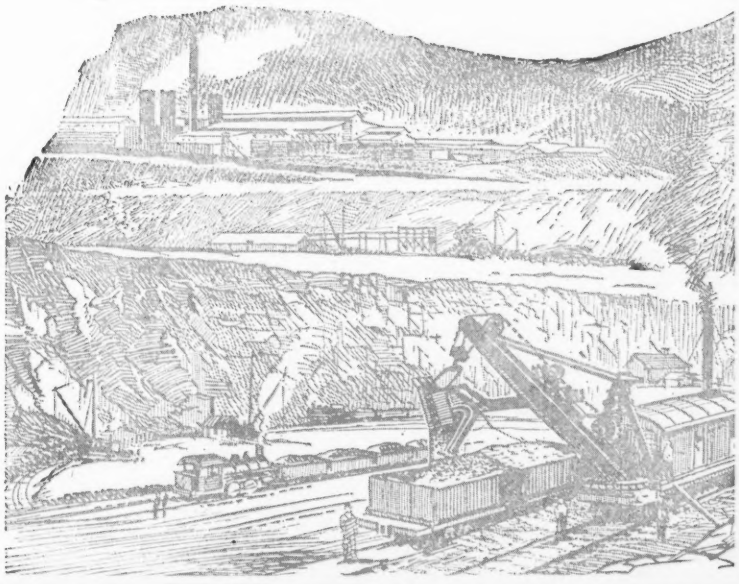


7' x 10' Tube Mill—Direct Motor Driven



Superior Jaw Crusher

H6

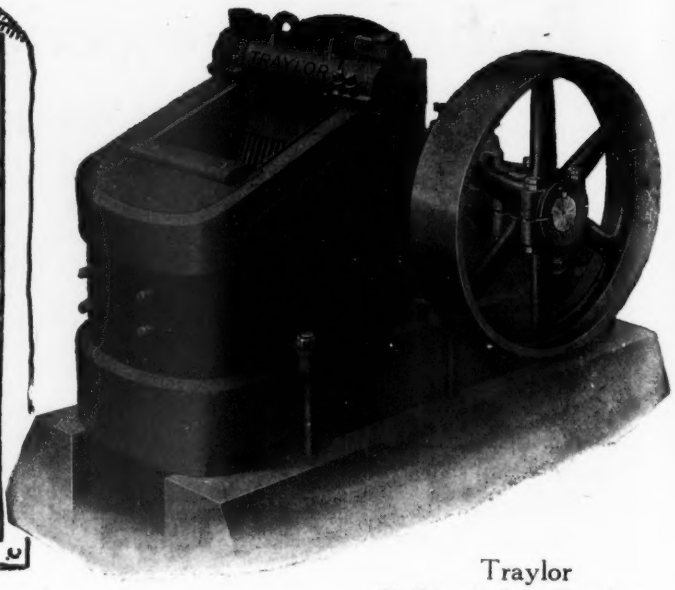


UMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY.

WORTHINGTON

Deane Works, *Holyoke, Mass.*
Blake & Knowles Works *East Cambridge, Mass.*
Worthington Works *Harrison, N. J.*
Laidlaw Works, *Cincinnati, Ohio.*
Hazleton Works, *Hazleton, Pa.*
Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works *Cudahy, Wis.*
Snow-Holly Works *Buffalo, N. Y.*
Epping-Carpenter, *Pittsburgh, Pa.*

from Agricola's "De Re Metallica"



Traylor "Bulldog" Jaw Crusher

Just Contrast This Height of Ancient and Modern Crushing Efficiency

"Look at our crude crushing machine of the 16th Century. It was simple, yes, but only in a theoretical way, and it was necessary to break the ore with a sledge to the size of your fist before it could be fed to the crusher.

Now examine this modern 20th Century Traylor "Bulldog" Jaw Crusher. Note its large receiving opening, its high degree of engineering perfection and above all its established record of practical performances.

The secret of its strength is in the design, its small power consumption depends upon its remarkably low frictional consuming toggle system, that rolls. It's the product of men who know the crushing needs of crusher men."

Catalog MJX-1 describes in detail what our ancient visitor has outlined in brief.—Send for it.

Traylor Engineering & Manufacturing Co.

Main Offices and Plant: ALLENTOWN, PA.

NEW YORK	PITTSBURGH	CHICAGO	LOS ANGELES	SPOKANE
30 Church St.	211 Fulton Bldg.	1414 Fisher Bldg.	Citizens Bank Bldg.	Mohawk Bldg.

Truck and Tractor Division: Cornwells, Bucks Co., Pa.

For Immediate Delivery

28 in. x 36 in. Bulldog Jaw Crusher
48 in. x 60 in. Bulldog Jaw Crusher
8 in. Bulldog Gyratory Crushers
36 in. x 16 in. Type "A" Crushing Rolls
42 in. x 18 in. Type "AA" Crushing Rolls

Traylor Motor Trucks and All-Purpose Tractors are built with that infinite care which shows a practical understanding of the work they are to do.

VULCAN LOCOMOTIVES

Day-after-Day

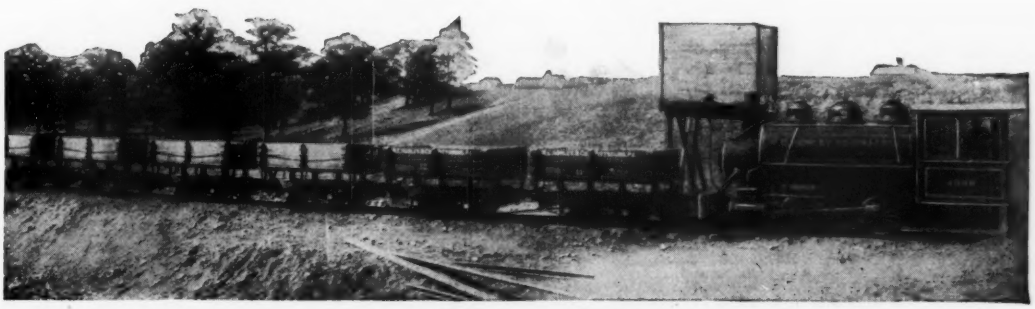
Whether you are taking on a new workman or a new locomotive you look for dependability, You want steady results first, day in and day out, and then the ability to draw on a little reserve for emergencies.

Vulcan Locomotives, both large and small, are built to give steady, reliable service of the sort needed for economical hauling and they also have a good reserve capacity which is usually hard to find in small locomotives. Let us know what your requirements are and undoubtedly we can give you data concerning similar conditions.

VULCAN IRON WORKS

Established 1849

1753 Main Street **Wilkes-Barre, Pa.**



THE KELLY ISLAND LIME AND TRANSPORT COMPANY, of Cleveland, operating quarries throughout Ohio and West Virginia, is one of the largest producers of limestone products in the country. "Marions" have been their approved choice for many years, twenty-three in all following the installation of their first shovel, a Model "G," in 1903.

The continued preference of this large organization for our products is typical of many others in the limestone industry. Owners and operators alike prefer "Marions" for they know that *"Marion" Quality and Service* can always be depended upon.

If you are needing a shovel for next season's work your order should be placed now to insure early spring delivery.

THE **Marion** STEAM SHOVEL CO.

Established 1884 Marion, Ohio

New York Chicago Atlanta San Francisco

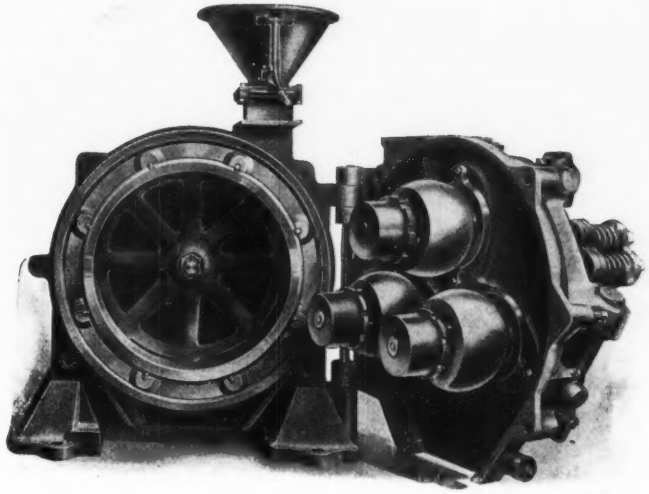
Boise, Idaho, - Clyde Equipment Co.
Billings, Mont., F. B. Connelly Co.
Dallas, - F. B. Wright, Bush Bldg.
Denver, - - - H. W. Moore & Co.
Detroit, W. H. Anderson T. & S. Co.
Vancouver, - - - - - - - - - - - Vancouver Machinery Depot, Ltd.
Montreal, Toronto, - - - - - - - - - - - - F. H. Hopkins & Co., Ltd.
Philadelphia, H. L. Cox, 13 & Cherry
Pittsburgh, - - - J. W. Patterson
Portland, - - Clyde Equipment Co.
Salt Lake City, H. W. Moore & Co.
Seattle, - - Clyde Equipment Co.

EVERYWHERE RELIABLE — THE Marion STEAM SHOVEL CO. — ESTABLISHED 1884

110

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

CRUSHERS, GRANULATORS, GRINDERS, PULVERIZERS, SCREENS, MIXERS, ELEVATORS, CONVEYORS, CHUTES.



Patented
AN "OPEN-DOOR" RING-ROLL PULVERIZER

Unequalled in Capacity, Small Power Consumption, Cheap Upkeep, Accessibility and Simplicity

PULVERIZERS

Ring-Rolls are slow speed Pulverizers, therefore durable, with large outputs, and are extensively used for reducing from 1½ inch to 80 mesh or coarser.

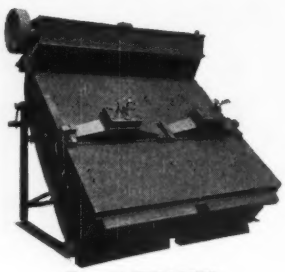
CEMENT-CLINKER, LIMESTONE, PHOSPHATE, FELDSPAR, FIRE-CLAY, SHALE

Release the bolts, throw open the door and every wearing part is within easy reach. One man can open a five-ton door in a very few minutes.

Is this not a time and labor saver? Can anyone afford a machine that takes hours and sometimes days to get into?

STURTEVANT MILL CO., BOSTON MASS.

HUM-MER *Electric* SCREEN



Type 31 HUM-MER

HUM-MER Electric SCREENS Installed in closed circuit with Hardinge Mills

Close the Circuit
and
Increase the Tonnage

THE work of a pulverizer is to crush material—not to screen it. Screening can be done for a small fraction of the cost of crushing.

When a grinder is slowed down to produce all-finished product, it is doing work that can be done at a far less cost.

In addition, the practice of holding material in a pulverizer until it becomes a finished product limits the capacity of the mill because the fines "cushion" the material being crushed and interfere with the crushing action.

HUM-MER "Electric" Screens, installed in closed circuit with pulverizers, remove the fines as fast as they are produced—at a fraction of the cost of crushing.

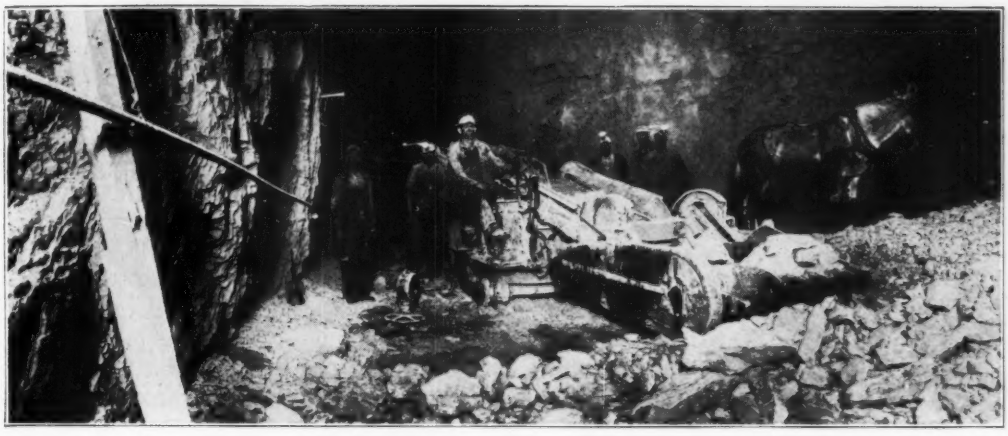
With the HUM-MER "Electric" Vibrating Screen back of a grinder, you can open up the grinder and feed it to the limit of its capacity—the fines will be thoroughly and economically removed by the HUM-MER.

In one installation, by increasing the feed to the mill and screening out the fines with the HUM-MER, the output of a given size material was more than doubled, and this with the same horse-power.

Send for HUM-MER Catalogue No. 42-R

THE W. S. TYLER COMPANY, *Cleveland, Ohio*

Manufacturers of Woven Wire Screens and Screening Equipment



No. 4 Size Myers-Whaley Shoveling Machine Loading Limestone Rock in An Underground Quarry

WHERE cramped working places and low headroom make it impossible to use a steam shovel it will load loose rock at the rate of a ton per minute of actual shoveling time, handling lumps up to a thousand pounds in weight, and doing as much work as 15 or 20 men.

Ease of operation and low upkeep, combined with Myers-Whaley service, make 70 per cent of our sales repeat orders.

Specifications No. 4 Size as Follows:

Weight—About 18,500 lbs. in working order.
Track Gauge—To suit your mine tracks.
Length—About 25 ft. over all.
Width—5 ft. 4½ in. over all.
Height—5 ft. 4 in. from rail, minimum.
Wheel Base—42 in.
Reach—10 ft. to each side from center of track.
Shovel—34 in. wide.
Motor—20 H.P., 250 ft. of cable on reel.
Capacity—One ton per minute in rock.
Will handle 1000-lb. lumps.
Shipping Weight—About 22,000 lbs. Boxed for export.
Full Crew—One operator, one car coupler, one helper.

Catalog and treatise sent on request.

Myers-Whaley Company : Knoxville, Tenn.

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Dieny & Lucas, 50 Rue Taitbout, Paris.
J. P. Cotter, P. O. Box 584, Sydney, Nova Scotia.
Maskin K. Lund Co., Kristiania, Norway.
Arthur Leplastrier & Co., Sydney, Australia.
Victor Lougheed, 96 Ninth St., San Francisco, Cal.
Richardson, McCabe & Co., Wellington, New Zealand.
Mitsuit & Co. for Manchuria and Shantung.
Okura and Co. for Japan and Korea.

GOOD ROADS

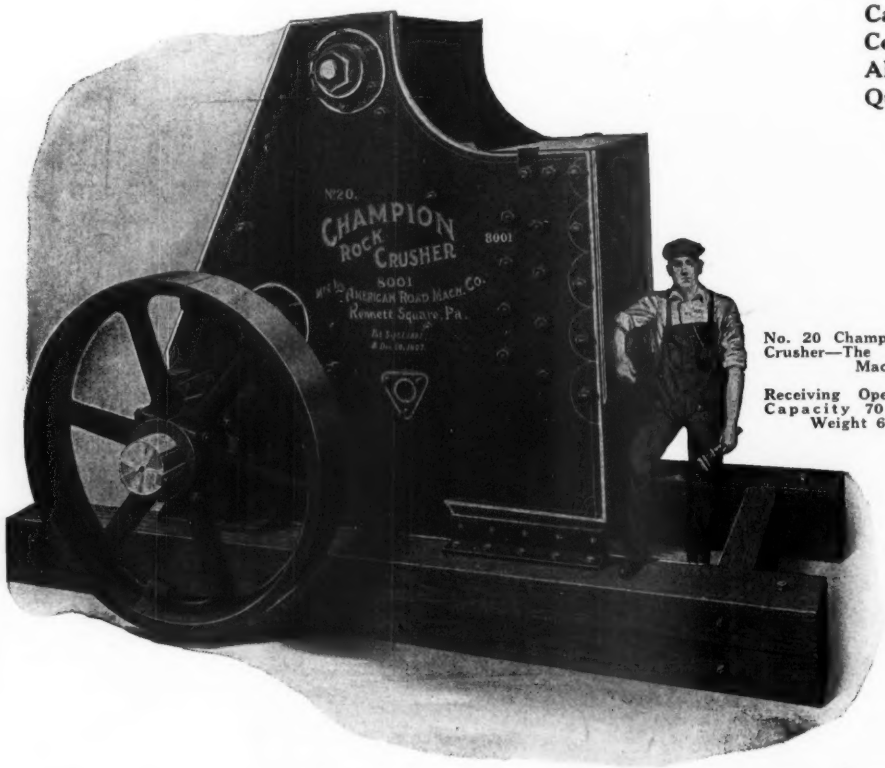
BUILT FOR BUSINESS

The Champion Steel Rock Crusher has been designed and constructed with the idea of strength and lasting qualities constantly in mind. Champion Crushers are built almost entirely of high grade steel and each wearing part is easily accessible and interchangeable. Champion Crushers make money for their users because they are of large capacity and cost little for upkeep. These crushers are made in many different sizes, with daily capacities ranging from 50 to 700 tons. We specialize in designing, building and equipping complete plants for crushing stone and handling sand and gravel.

Ask for Crusher Catalogue K. A. U. or Sand, Gravel Machinery Catalogue No. 5

A Partial List of Our Products

Rock Crushers
Elevators
Revolving Screens
Shaker Screens
Sand Separators
Cable Buckets
Conveyors
All kinds of Quarry Machinery



No. 20 Champion Steel Rock Crusher—The Ton a Minute Machine

Receiving Opening 22" x 50", Capacity 70 to 100 Tons, Weight 61,500 Lbs.

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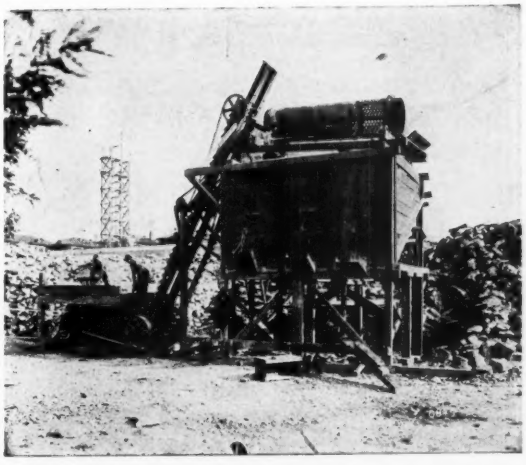
Don't Design It—Just Write Us

Portable outfit for loading bins from ground storage, showing Jeffrey Continuous Bucket mounted on a four-wheel traveling truck



Road building outfit showing Jeffrey Continuous Bucket Elevator, which carries stone from crusher to revolving screen

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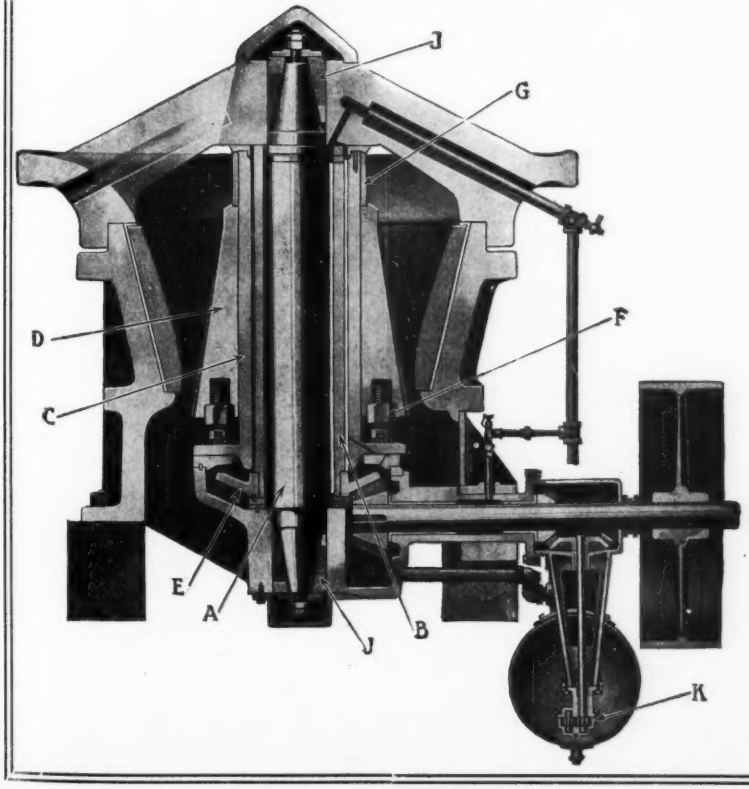

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PLYMOUTH
Gasoline Locomotives

Plymouth Locomotives Participate in Record Pour

Says Siems, Helmers & Shaffner, of Saint Paul, Minn.:

"We are using two six-ton PLYMOUTH Gasoline Locomotives on our road contract in Rice County, Minn., and yesterday, (October 11, 1920) we poured 1072 lineal feet of roadway, 18 feet wide, and 7 inches deep, in 10 hours and 15 minutes."

So far as we know this is a record.

They say further:

"We are convinced that your gasoline locomotives are far superior to steam for road building purposes. They have a great deal more power and are much easier on the track. On account of low center of gravity they adhere to the track and there are fewer derailments. To date we have had good success with your two locomotives and like them."

The Fate-Root-Heath Company, Plymouth, Ohio, U. S. A.

Rock Products

Vol. XXIV Chicago, February 26, 1921 No. 5

Rock Dust Collecting a Fine Art

Metro-Nite Company, Milwaukee, Wisconsin, Has Developed an Unusually Efficient System in the Manufacture of Pulverized Dolomite Extenders for Paints and Enamels

IT IS A WELL-KNOWN FACT that in the preparation of stone to be used as an extender for mixed paints and enamels that the very fine particles of dust caught during the grinding of the material from pieces of stone to powder, is really the most valuable product. Realizing this, and also the fact that considerable dust was created during the whole process of manufacture, possibly making conditions somewhat unhealthful for the workmen, the Metro-Nite Co., of Milwaukee, Wis., has developed a dust-collecting system that is not only remarkable for its efficiency but also for its simplicity. This company designed and manufactured itself most of this equipment used for dust collecting.

Character of Stone

The company's quarry is located at Felsch, Mich., while the pulverizing mill is located in North Milwaukee, Wis. The rock is shipped from Felsch, Mich., to the mill in box cars, in sizes that can easily be handled by one man. The rock is loaded and unloaded by hand, thus giving a double opportunity to reject stone that does not come up to standard requirements; it must be pure white and contain no foreign matter. The stone is of a crystalline character and has the following chemical analysis:

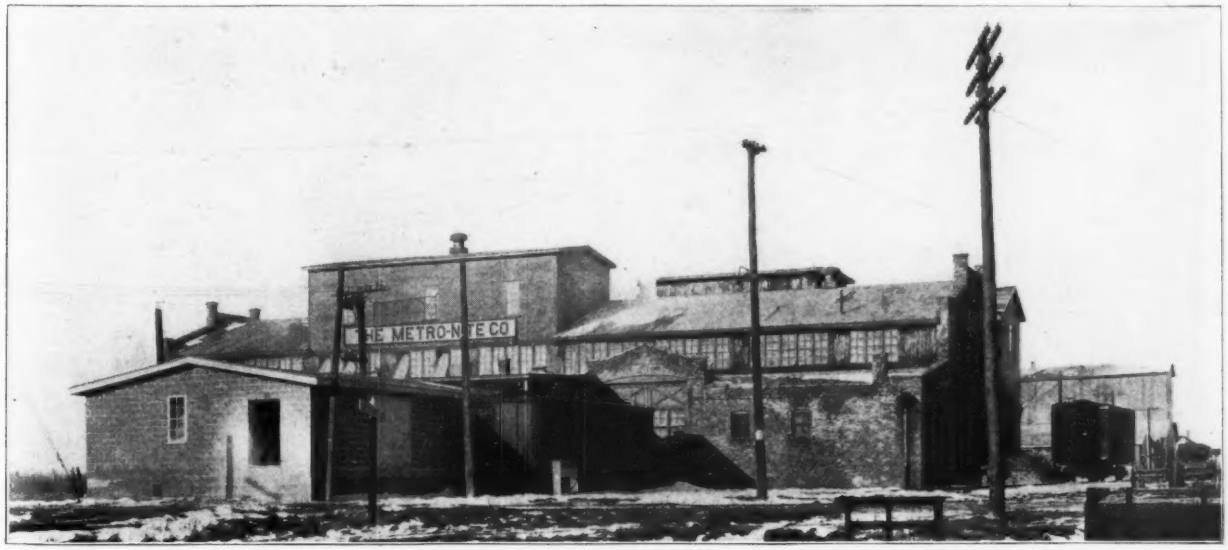
	Pct.
Calcium carbonate ($CaCo_3$)	44.62
Magnesium carbonate ($MgCo_3$)	35.65
Calcium magnesium silicate ($Ca_2Mg_2SiO_3$)	19.58

It can be readily seen from the above analysis that the stone is really a siliceous dolomite.

Crushing Plant

As the stone is unloaded from the box cars on a railway siding adjacent to the plant, it is chuted direct to a 12x22-inch jaw crusher, reducing the material to about 1½ inches in size. The stone is then reclaimed by a bucket elevator of 40-foot centers which deposits it in a storage bin of 250 tons capacity. As the stone is needed it is dropped through gates by gravity on a short belt conveyor of 25-foot centers, located underneath the bins, which deposits the rock into a No. 3 gyratory crusher for further reduction. From here it is again reclaimed by another bucket elevator of 50-foot centers and deposited in a storage bin of 15 tons capacity.

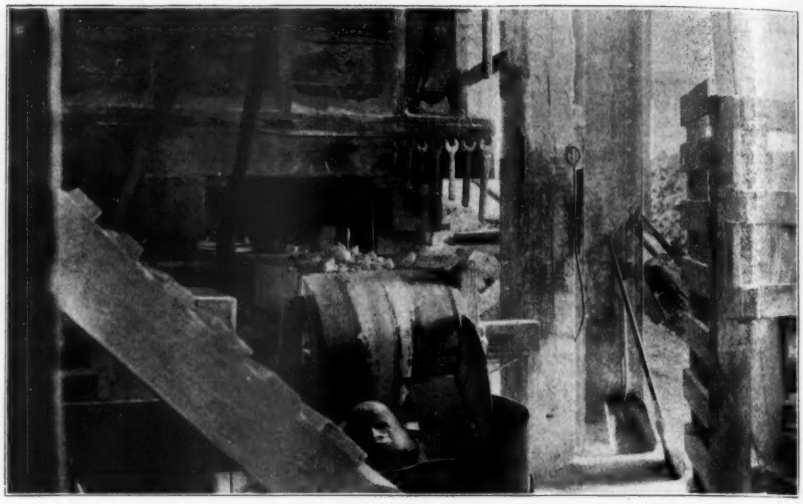
If stone is desired for stucco purposes, the material from the 15-ton bin is chuted to a set of 24x14-inch rolls, set 5/8 inch apart, and then reclaimed by a bucket elevator of 50-foot centers, depositing the material over a gravity screen, 12 feet long and 20 inches wide, of 5/8-inch mesh. The material going through this screen is chuted to a 10-inch screw conveyor, 50 feet in length, which discharges into the steel hopper over the feed end of the tube mills. The over-size is chuted to a bucket elevator, 45-foot centers, which deposits the material in a storage bin of 60 tons capacity. From here the material is either gravity-fed by means of chutes to cars in the case of large orders or bagged in the case of small



General view of plant of Metro-Nite Co., North Milwaukee, Wis.

orders. This material is entirely sold for decorative purposes in stucco work.

From the 15-ton storage bin mentioned before the material can also be fed into a battery of Sturtevant ring-roll mills, reducing it to ¼-inch and under. The ring-roll mills are only used in case the stucco bin is full, as the other rolls will create enough fine material to be fed into the tube mills. The material from the ring-roll mills is reclaimed by the same bucket elevator reclaiming from the rolls, which deposits it over a gravity screen of ⅛-inch mesh, set at an angle of 45 degrees. The ring-roll mills and the rolls are never run simultaneously. The ⅛-inch and 5/16-inch mesh screens are interchangeable. The fine material going through the ⅛-inch screen goes to the screw conveyor mentioned before, while the over-size is chuted back to the ring-roll mills for recrushing. The screw conveyor discharges into the two steel hopper-bins feeding the tube mills.

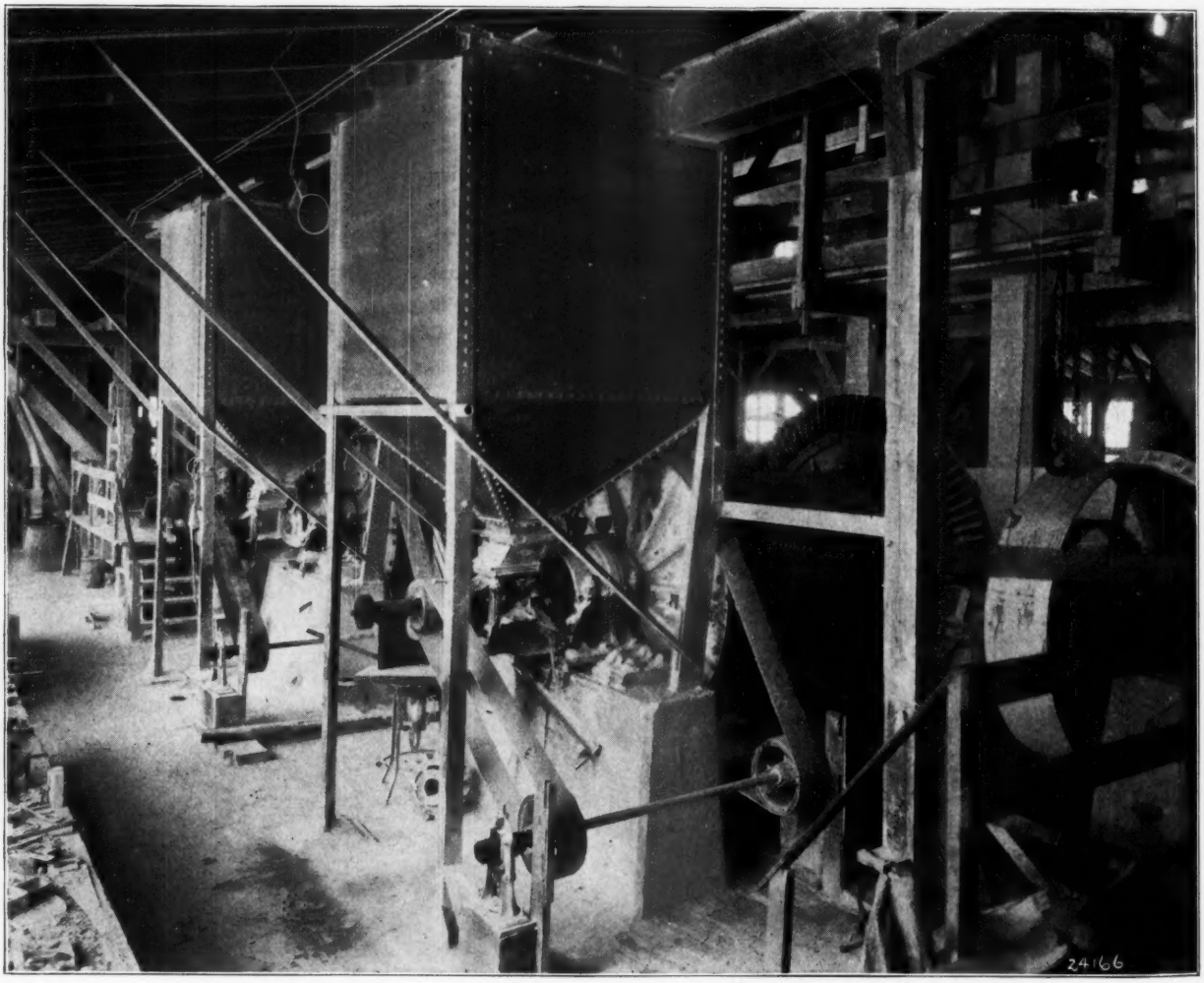


Belt conveyor underneath stone bins leading to gyratory crusher

Pulverizing and Air Separation

The two tube mills are 22 feet long, 5 feet in diameter, and are belt-driven from two 100-hp. motors. The mills are lined with Belgian blocks and are half filled with Belgian pebbles. Both mills have a continuous feed.

At the discharge end of each tube mill

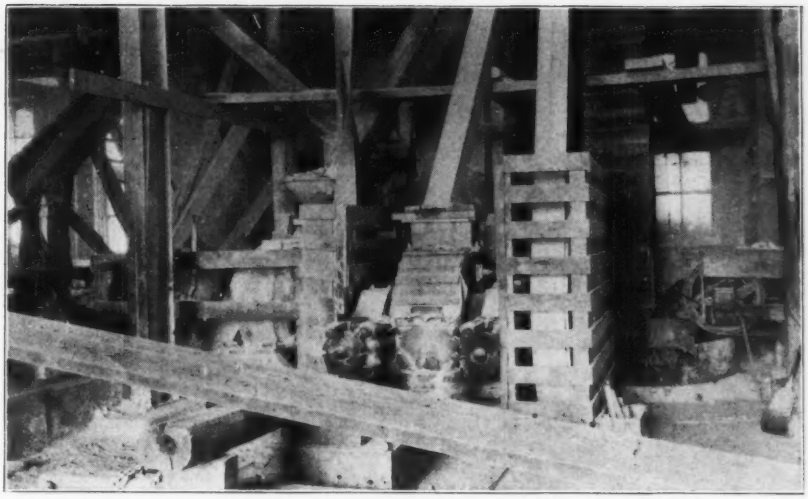


Steel feed tanks for tube mills showing drive from countershaft. Screw conveyor overhead

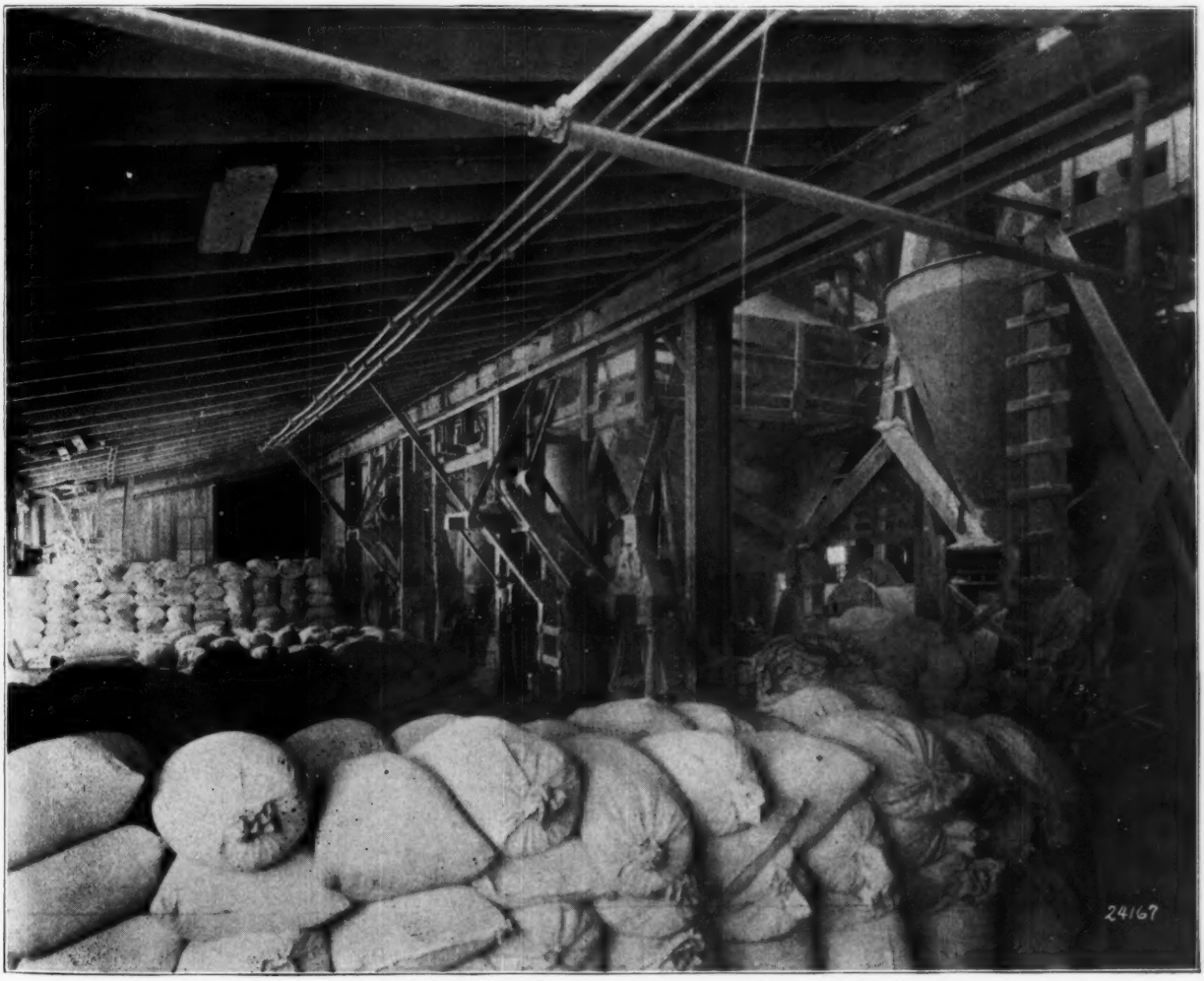
is located a bucket elevator of 40-foot centers, which deposit the material into the air separators. A system of four separators has been installed here, the two middle ones being of the company's own design and manufacture, while the other two are the Raymond system. The two bucket elevators receiving the material from the discharge end of the tube mills, discharge their material into the last three of the battery of four air separators, the first one being used for separation of the tailings or coarse material only. This will be touched upon again later.

Between the two tube mills is located a third bucket elevator, which is used in case of emergency only. The pulverized material from either ball mill can be chuted to this elevator.

The four air separators consist of one conical air separator proper, and two cyclone collectors, giving two grades of separation, the material being bagged from either cyclone. The first cyclone makes a coarse separation, while the second makes a finer separation. This is illustrated in one of the accompanying sketches. Air is injected into the separator, causing the heavier or coarse particles to fall to the bottom, while the finer particles are carried to the first cyclone, and the still lighter and finer to the second cyclone.



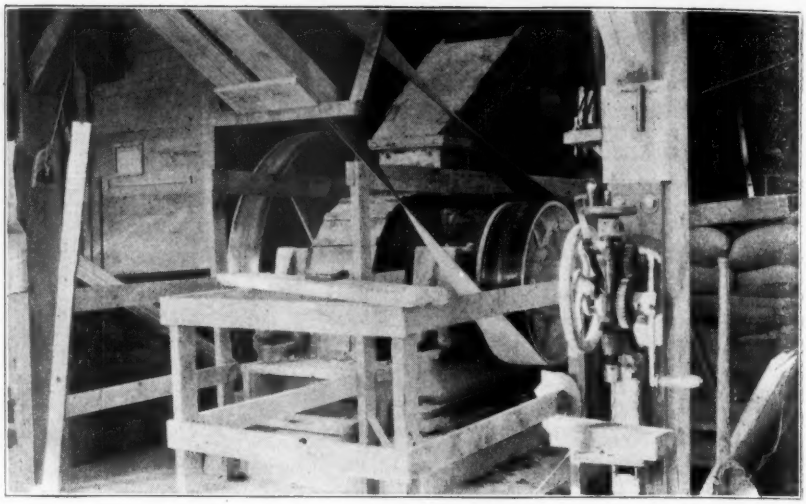
Crushing rolls and ring roll mill. Note enclosed elevator in back of each



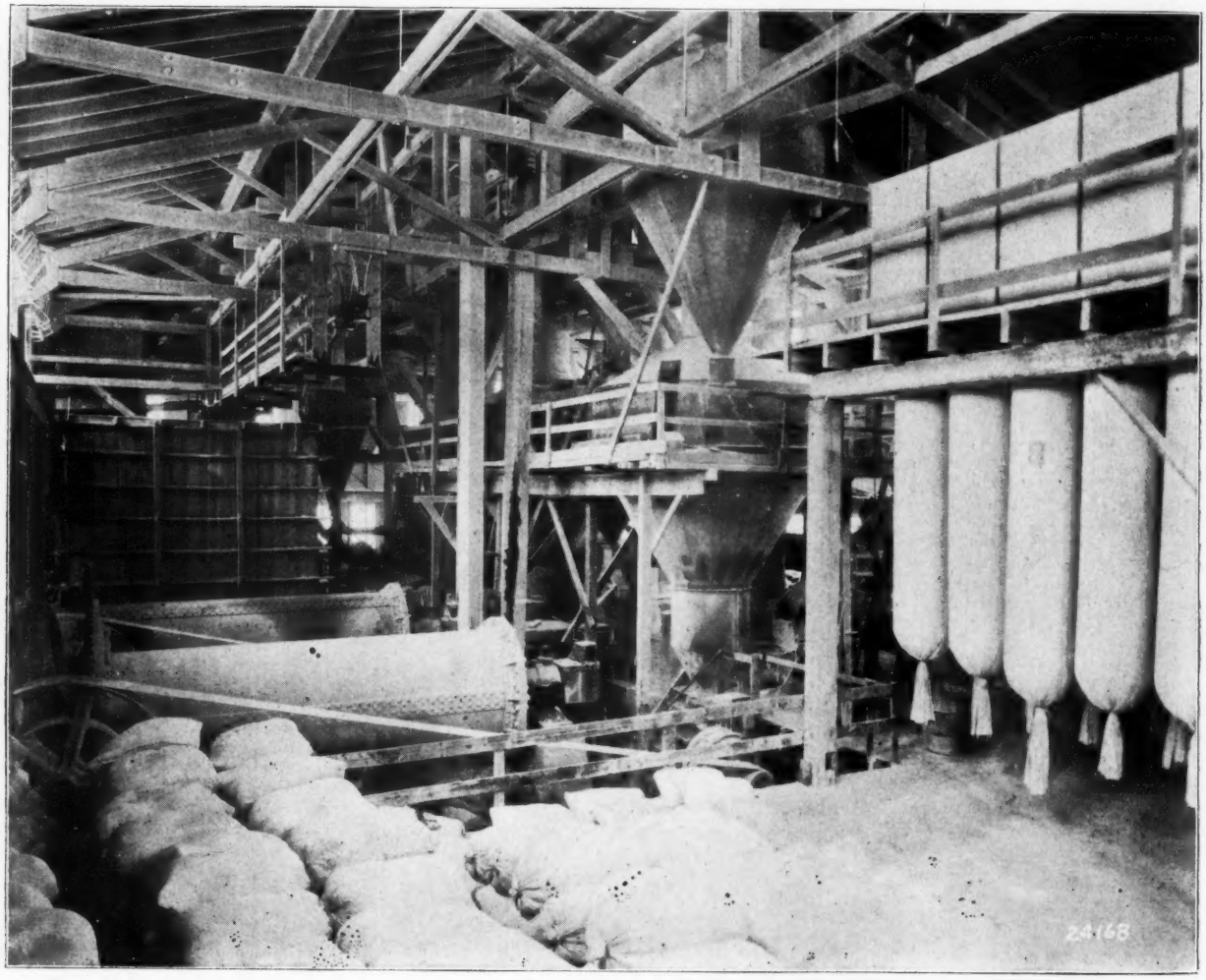
Air separators and cyclones. Note two spout packers from cyclone

Running the entire length and underneath the four air separators is a 14-inch screw conveyor into which the coarse material falls from the bottom of the air separators. This is reclaimed by a fourth bucket elevator located between the first and second air separators. This bucket elevator deposits the material into the first air separator which was mentioned before and whose only function is to give the material another chance for separation before conveying it back to the tube mills for re-pulverizing. The coarse material finally rejected from this first air separator drops into a 14-inch screw conveyor, which conveys it to a bucket elevator of 50-foot centers, depositing the rejected material in the original screw conveyor feeding the storage tanks over the tube-mill feed.

An interesting contrivance here is the installation of a rotary screen 6 feet long and of 20-inch diameter, located near the screw conveyor feeding the tube-mill supply tanks. If a 60-mesh material is desired, the coarse material rejected from the air separators is chuted to this screen instead of to the screw conveyor feeding ball-mill storage tanks. The 60-mesh material passing the screen is then chuted direct to a spout-packer, while the over-size is chuted to the original screw



Rolls for recrushing

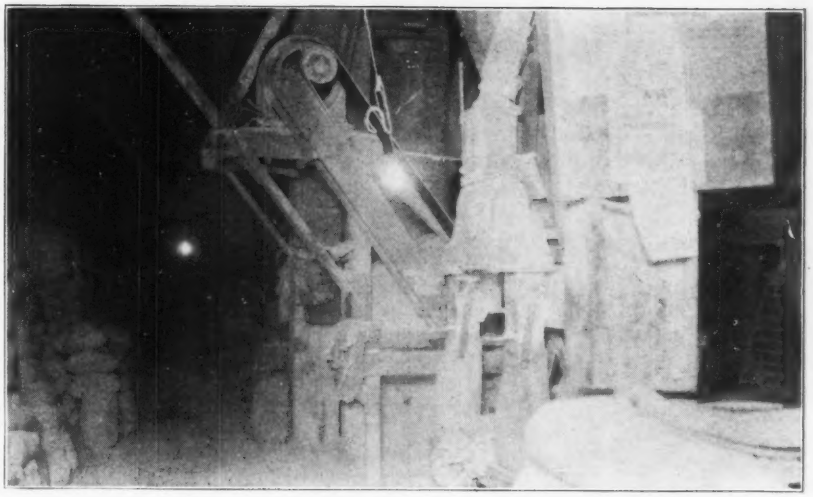


Tube mills and drive from motor. System of air separators and cyclones. Storage bin for stucco stone in rear

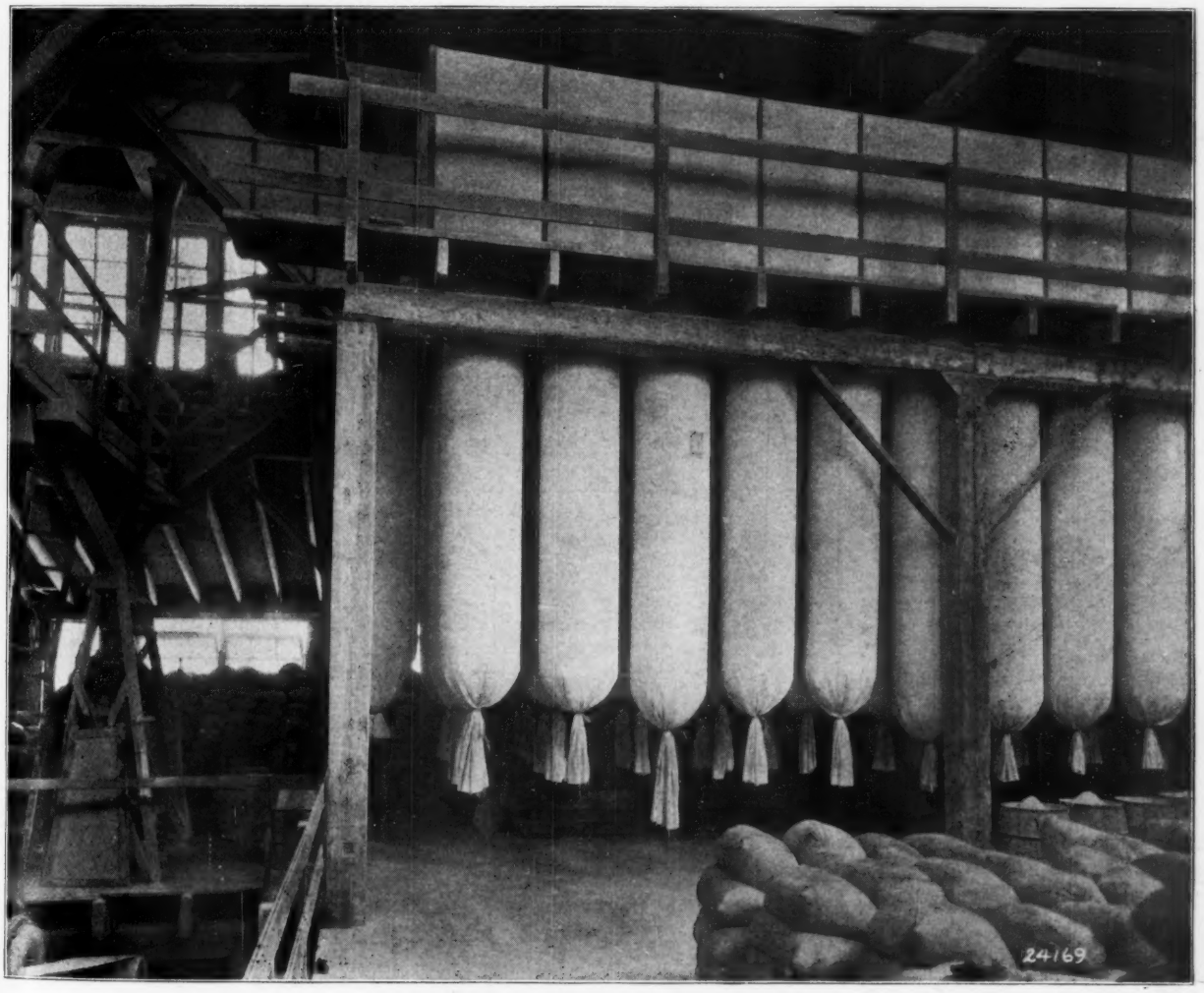
conveyor feeding the tube-mill supply tanks. The 60-mesh material is rather gritty and is used in the manufacture of hand soaps, metal polish, etc. The material from the cyclone collected ranges from 200 to 300-mesh and is used as an extender for paints, as whiting, etc.

Dust-Collecting System

In the preparation of so fine a material a great deal of loose dust is created, and since this is the most valuable product the company collects and bags it also. A 20-inch exhaust fan operating through a system of pipes placed at any advantageous point where dust is created and may be collected draws this fine material (about 350-mesh) into a dust compartment or room underneath of which are located 25 filter bags through which the cleaned air is exhausted and in which the fine dust collects. Another similar fan draws the material into a smaller dust room underneath of which is four filter bags. The bags are shaken every five hours. The accompanying photographs show both larger and smaller dust rooms and bags. In this way the company not only collects a valuable product but also makes conditions more healthful for its employes. The Metro-Nite plant has a total capacity of 150 tons of pulverized material in ten hours. A total of 750



The spout for bagging from cyclones



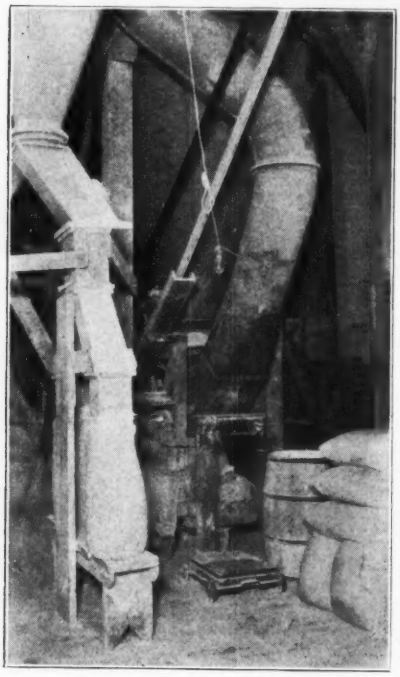
Dust bags and dust room for fine dust collecting. These bags are emptied every five hours

hp. is used in running machinery, which of course, is all electrically driven.

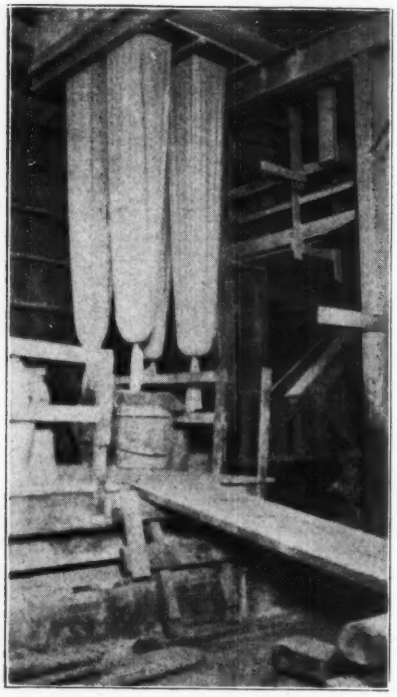
Use as a Pigment

This material is in use by some of the most prominent paint manufacturers in the country, as an extender for mixed paints, enamels and paste paints. The principal advantage claimed for this material is that it consumes only a small amount of oil, yet produces a great bulk and holds well in suspension. The color of this material is a very clear white and it is easily ground, which probably explains its excellent reputation among paint manufacturers.

The secretary and general manager of

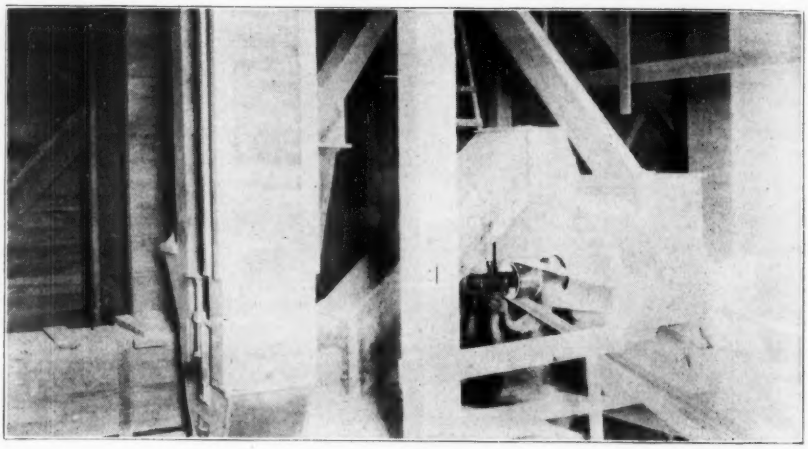


Two-spout packer from cyclone

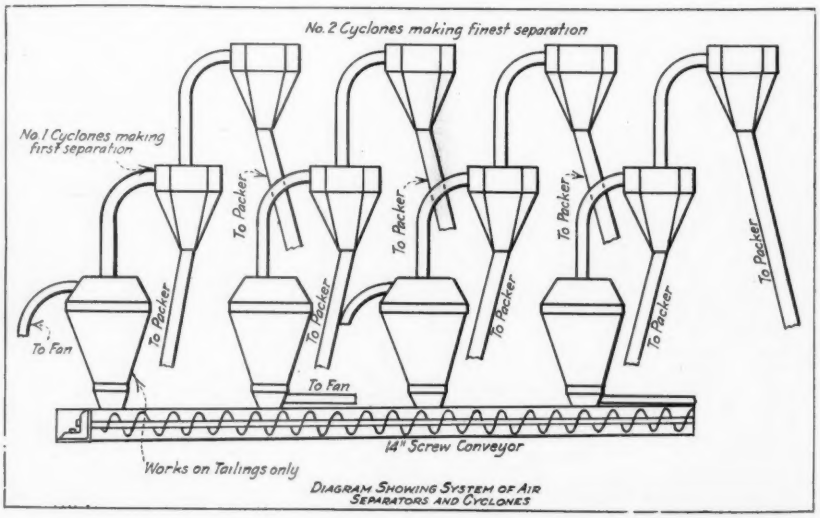


Filter bags containing fine dust

Filter bags for dust collecting. Dust room overhead. Storage bin for stucco stone at extreme left



Fan and spouts for dust collecting



Air separators and cyclones. Not to scale. Screw conveyor shown in plan

this company is Edward Copps, who designed the system of air separators illustrated. Mr. Copps has been in this business for the last 15 years, and prior to that he was an economic geologist. Mr. Copps is also secretary, treasurer and general manager of the Olivine Co. and president of the Michigan Quartz Silica Co., both of which have plants located on the same property in Milwaukee.

Wide Divergence in Costs of Quarrying and Crushing Stone

The discussion of production costs per ton of stone at the Toronto convention of the National Crushed Stone Association disclosed many surprises. The cost sheet as reported by quarrymen from all sections of the United States and compiled by President Rice showed a maximum cost per ton of $1.69 and a minimum cost of 59 cents. This wide difference proved that quarrymen were not figuring cost production on the same basis.

These figures and the wide difference between the maximum and minimum cost are startling and indicate that quarrymen should make a deeper study of cost production and consult a competent cost accounting bureau. Naturally there are widely different conditions under which crushed stone is manufactured. A thorough knowledge of all items of expense that could honestly be counted in cost production might lessen the number of quarry plants that complain of making no profit on their investment.

Item	Cents Per Ton
Maximum cost of fuel per ton on Limestone	15
Minimum cost of fuel per ton on Limestone	4
Trap Rock, Maximum	15
Trap Rock, Minimum	6
Labor cost per ton—	
Limestone, Maximum	98
Limestone, minimum	13
Trap Rock, Maximum	73
Trap Rock, Minimum	23
Material cost per ton—	
Limestone, Maximum	53
Limestone, Minimum	04
Trap Rock, Maximum	44
Trap Rock, Minimum	03
Explosives cost per ton—	
Limestone, Maximum	16
Limestone, Minimum	04
Trap Rock, Maximum	14
Trap Rock, Minimum	05
Depreciation cost per ton—	
Limestone, Maximum	21
Limestone, Minimum	005
Trap Rock, Maximum	20
Trap Rock, Minimum	10
General expense cost per ton—	
Limestone, Maximum	37
Limestone, Minimum	04
Trap Rock, Maximum	32
Trap Rock, Minimum	08

The secretary was instructed to furnish printed reports of cost production to those only who had reported. This policy being in line with instructions given to secretary at Louisville Convention one year ago. These printed sheets have been mailed by the secretary to those entitled to same.

Upon motion of H. E. Bair of the France Stone Co., Toledo, O., the secretary was unanimously instructed to ask for cost production reports from all quarrymen whether members of this Association or not on 1920 output. The secretary was instructed to continue the same cost groupings and outlines they used on cost production 1919. He was also instructed to ask quarrymen for a list of cost items under each group and then make up an official cost item sheet and ask quarrymen to base their reports on this uniform cost sheet so as to arrive at a more uniform production cost.

Agreement was reached that if a quarryman could make five cents a ton profit on each ton sold and this profit estimated on an honest actual cost of producing one ton of stone that quarrymen would have a safer investment than the quarryman who thought he was making 10 or 15 cents per ton profit, but who did not know his actual production cost.—Bulletin of the National Crushed Stone Association, February 15, 1921.

Bedford Limestone Producers to Lower Wages

THE BEDFORD STONE CLUB, of Bedford, Ind., at a meeting recently took the first step toward lowering wages of the men in every department of the stone industry at this place. Resolutions were adopted saying that during the World War wages were raised to an abnormal level, forcing the prices of building material up to a point where it was now impossible for prospective builders to obtain money to build.

Discovery of Mica in British Columbia

A PARTY OF EX-SOLDIER PROSPECTORS, headed by Major H. G. Forster, are reported to have discovered what is described as a mountain of mica in the northern part of British Columbia.

View shows character and size of stone as it is brought in box cars from quarry at Felsch, Mich.

Unusual Ground Storage System

Belt Conveyors on Suspension Bridges Provide Means of Placing 200,000 Tons of Crushed Stone in Storage Piles

TO PROVIDE the necessary crushed stone for the immense amount of concrete work in connection with the large hydro-electric development known as Chippewa-Queenston Development which takes part of the water of the upper Niagara River and diverts it through the Chippewa Creek to an open canal about 12 miles long to the new hydro electric power plant at Queenston, Ont., the Hydro-Electric Power Commission of Ontario has built a large and modern stone crushing plant which has a number of novel features.

The stone supplied to this plant is excavated from the open canal and is good, hard stone, well adapted for concrete work of the better sort. The steam shovels used have excavated as much as 8000 tons of rock per eight-hour day from the canal. Only a portion of this stone, however, is sent to the crushing plant, which has a capacity of approximately 4000 tons per eight-hour shift. The stone is transported from the shovels to the crushing plant in 20-yard, air-operated, side-dump cars hauled by electric locomotives. The cars are dumped into a large chute or pocket of exceptionally heavy construction and lined throughout with steel. This chute delivers the stone to a 60x84-in. sectional all-steel jaw crusher (Traylor) identical with that used on the Kensico Dam job of the New York Board of Water Supply, and now at the plant of the Riverside Portland Cement Co., Riverside, Calif.

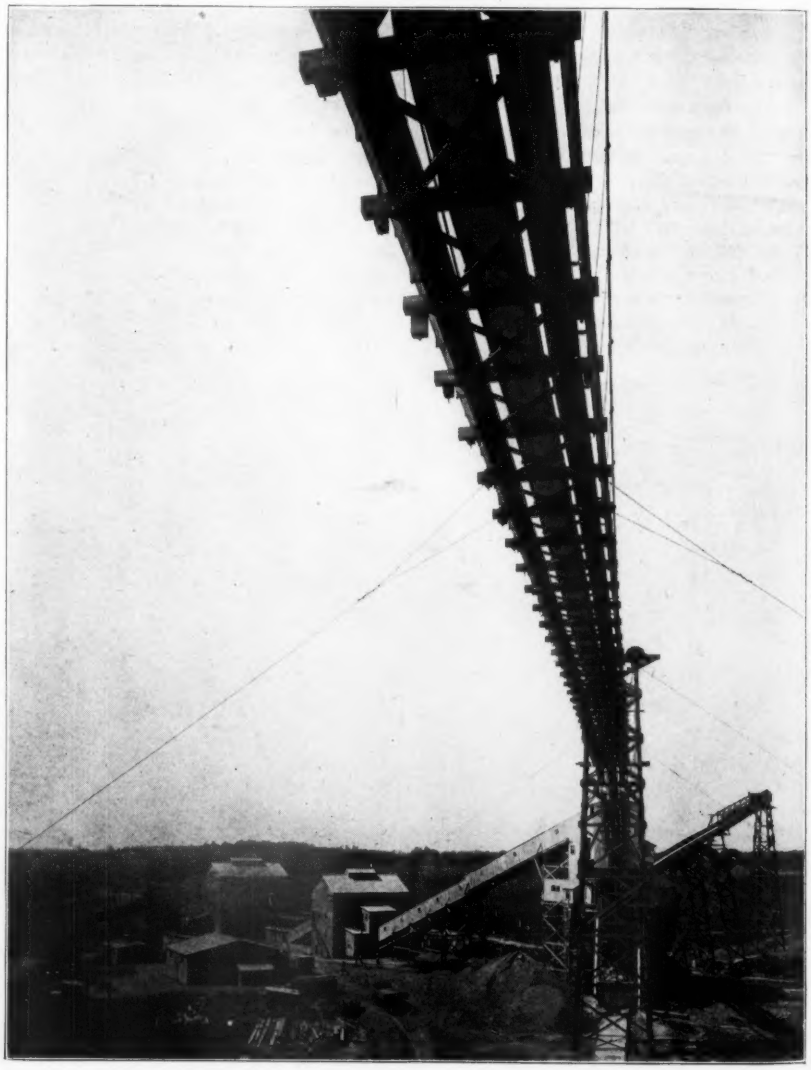
Crushing Plant—Variable-Speed Crusher

This crusher is set to about 7 in. and is driven by a 300-h.p., slip-ring type motor connected up through various electrical devices and resistance grids so that it can be run at any number of revolutions from half speed up to full speed. This is made necessary through the fact that at times a very large percentage of the stone delivered to the crusher is of so small a size that if the crusher were operated at full speed, the stone would pass through it so rapidly that the balance of the plant would be burdened far beyond its capacity.

The product of the crusher falls on a heavy stationary steel grizzly so arranged that the fines from the grizzly fall on a 36-in. belt conveyor first so as to form a cushion for the larger stone. This conveyor is about 200 ft. long and runs on a 20-degree incline and delivers the product of the initial crusher to a battery of four gyratory crushers without screening. Two of these crushers are 16-in. Traylor "Bulldog" gyratory crushers and two are No. 7½ McCully crushers. All four of these crushers are set to 2 in. and deliver their combined product to a second 36-in. belt conveyor, also operated on a 20-degree incline about 225-ft. centers which delivers to an 84-in.x30-ft. open end heavy-duty revolving stone screen (Traylor) fitted with a dust jacket having ⅜-in. perforations. The screen proper is fitted with manganese steel screen plates divided into the following sizes: 1⅞-in., 3-in. and 3½-in. perforations. A small gyratory crusher is installed to crush the oversize from this screen, but so far it has not been used.

Suspended Conveyors

The fines from the dust jacket are delivered to an inclined conveyor which conveys them to a storage pile located on one side of the screen building. The fines from the main screen are discharged into a series of bins located so that the various size stone can be drawn into railroad cars. The bins are also arranged to discharge onto a 24-in. belt conveyor



Belt conveyor on suspension bridge for ground storage of crushed stone

over 400 ft. long. The support for this conveyor is carried from steel cables suspended from high wooden towers in the same manner as the well known suspension bridge is built. This conveyor is provided with a tripper so that the stone can be delivered to storage piles underneath the conveyor which are more than 100 ft. high. This ground storage has a capacity of over 200,000 tons of crushed stone, which is cheaply recovered by means of belt conveyors operated under the piles, or by locomotive cranes.

Pumice Stones Available for Export from Turin, Italy

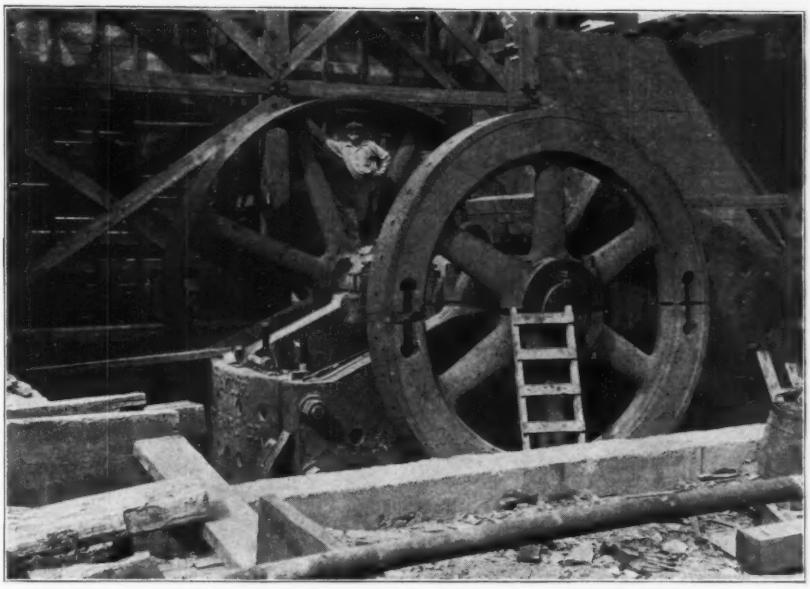
A REPORT FROM CONSUL SYCKS, of Turin, states that an exporter of that city is able to export from 50,000 to 60,000 pumice stones per month at 1.80 lire apiece, packed in wooden boxes of 200 or over, f. o. b. Genoa, Italy. Further information might be obtained from the European Division of the Bureau of Foreign and Domestic Commerce.

Use of Agricultural Limestone Increases

THIRTY-SIX Missouri County agents who have done considerable work to improve the acid soils in their counties report that 18,041 tons of limestone were applied in their counties during 1920—considerably more than the amount used in the entire state in any preceding year.

Perry County farmers, for instance, were determined to grow clover and for this purpose used 6400 tons of lime last year. Ralls and Cape Girardeau were close seconds, for in each county limestone was used on more than 100 farms.

Where limestone was widely used during recent years its value has been so clearly demonstrated that the practice of liming sour soils will become universal.



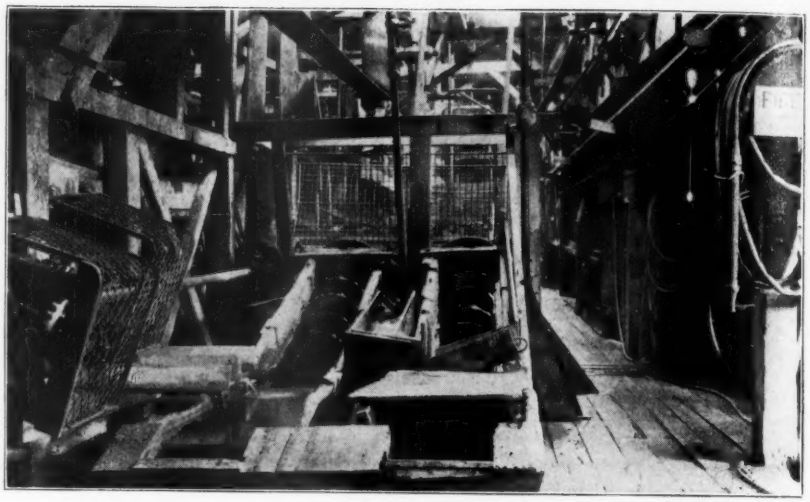
Jaw crusher, 60x84-in., used as a primary breaker

General view of the crushing plant and storage system of the Hydro-Electric Power Commission of Ontario

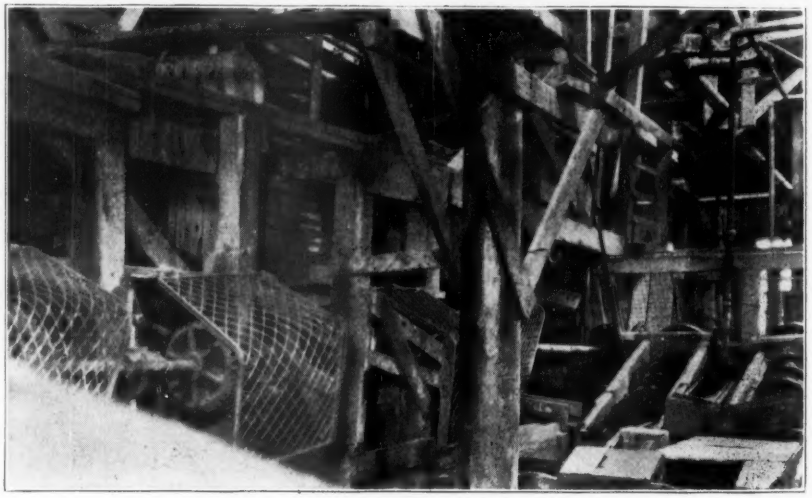
Hints and Helps for Superintendents

Wire Guards for Gear Drives

THE TWO VIEWS BELOW illustrate the method used by the Pittsburgh Plate Glass Co. at its Ford City, Pa., sand plant in safeguarding against accidents caused by defective gear drives. This safeguard consists merely of wire netting of the heavy type such as would be used for fencing, attached to strips of light iron. This facilitates the bending of the netting so as to totally cover a bevel-gear drive, besides helping to keep the netting in good shape. In the event of a loose drive, or the stripping of gear teeth, the flying metal will be stopped by the wire netting, thereby preventing serious injury to any of the workmen who may happen to be close by.



Gear guards of the sand plant of the Pittsburgh Plate Glass Co.



Near view of bent wire gear guards

Methods of Making Friction Hold

FROM TIME TO TIME we have received communications from shovel runners advocating various methods which they have tried for making friction hold.

Among the many may be mentioned the following: Fullers earth, powdered chalk, powdered coal, flour, hardwood ashes, and steam. All of these have advantages of their own and many have disadvantages.

A shovel operator with many years of experience has given us a new suggestion.

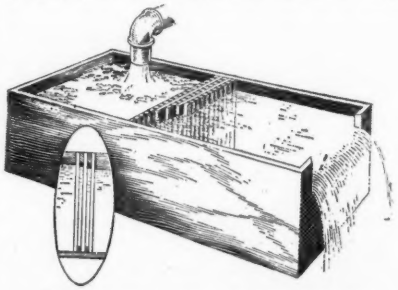
He advises that flour is all very well, it undoubtedly cuts the grease and makes a smooth surface by filling in whatever cracks there may be in the housing, but although it allows the friction to slip it does not have the quality of making it hold when the ram is in.

Some shovel runners advocate tapping the injector pipe between the globe valve and the injector, attached there to a hose, regulating the proportionate amount of water and steam by means of the injector handle. This, as he advises, cuts the grease and washes off the grit very effectively, but has the same objections as flour. In other words, it does not insure that the ram will hold.

His solution for the difficulty is plain tallow scraped from a tallow candle. This is shaved off and allowed to fall between the housing and the friction band. This will not only clean the housing and make a smooth surface by filling out the blocks as flour does, but it also has the added advantage of making the friction hold.—"The Excavating Engineer."

Stilling Rack for Sand Settling Boxes

THE DEVICE illustrated herewith was designed by George S. Binckley, a consulting hydraulic engineer of New York City, as a stilling rack for weirs used in measuring the flow water in flumes, etc. It has a possible use in the sand and gravel industry in retarding the current from the overflow weir or flume of any ordinary sand-settling box or tank, thus increasing the amount of fine sand deposited in the box. Sand with a considerable amount of fine material may be desirable for certain purposes, or the recovery of very fine sand



Stilling rack for sand-settling box

for asphalt filler or other use may be necessary.

The principle upon which this "stilling rack" is based is extremely simple. The rack is composed, as seen in the sketch, of strips of wood, placed with spaces between them about one-third their width, or less, there being three sets of these strips ordinarily (although more may be used at times), separated from each other by horizontal strips, at top and bottom only, and nailed to these last, forming a unit which fills the cross section of the weir box, and which is secured to it. The vertical strips in the middle series are so placed as to come opposite the openings on each side. In this way the water is deflected in its flow through the stilling rack.

Portable Power Line Rack

THE FRANCE FOUNDRY AND MACHINE CO., North Baltimore, O., a subsidiary of the France Stone Co., Toledo, O., has placed a portable power line rack on the market. This rack is the result of long experience by the France Foundry and Machine Co. in making the necessary quarry equipment for the France Stone Co.

This rack is about six feet high and is constructed of iron pipe. It is very rigid and yet so light that one man can move it about, besides being well insulated so as to prevent groundage.

The company makes the following recommendations for users of electric blast-hole drills: (1) The use of a complete circle line for supplying power to the drills, unless the quarry is so large that this will be impracticable. This circle can be attached to the source of power at any convenient point. With the circle line the voltage will always be good and of about the same value regardless of where the drill is located along the line.

(2) The use of stranded weather-proof wire for the portable line. No. 6 wire is a good average size for 440-volt current unless the line is exceptionally long or several drills are on the line.

(3) The use of about 100 ft. of "No. 8 three-conductor Duracord" (for three-phase, 440-volt current) for a cable to reach from the drill to the portable line.

(4) The use of "Hubbell weather-proof attachment plugs" every 75 ft. along the portable line, for attaching the Duracord cable to the portable line. Both wires of an attachment plug base should be soldered to each of the portable power line wires, and well taped. An attachment plug cap should be fastened and soldered to each of the conductors of the Duracord cable. The conductors of the Duracord cable should be separated from each other for a distance of about two feet from the attachment plug caps,

(5) The use of a 1½-in. swinging and should be taped up carefully. pipe mounted in the top of the drill cab for supporting the Duracord cable in such a way that the wheels of the drill will not run over it. This should be composed of a vertical section strapped in the cab, an elbow at the top of the vertical section and free to swing horizontally, a horizontal section about 10 ft. long with a 45-degree bend downward at the outer end. About 4 ft. out from the elbow, this horizontal section should have a suport on which the pipe can rest and slide from side to side. The open ends of the vertical and horizontal sections should be fitted with 1½-in. conduit bushings. The Duracord cable should be fed through this pipe and taped quite heavily at the open ends of the pipe so that the cable will not be injured at these points. At the bottom end of the vertical pipe an ordinary cable clamp should be clamped on the Duracord cable over the heavily-taped portion of the cable. This will prevent the cable from being pulled out of the pipe.

(6) The use of the General Electric Co.'s type FP10 oil circuit-breaker on your drill instead of knife switch and troublesome fuses. The circuit-breaker should have overload coils so as to protect the motor against overload. This type of breaker should also be used to control the power for the portable line.

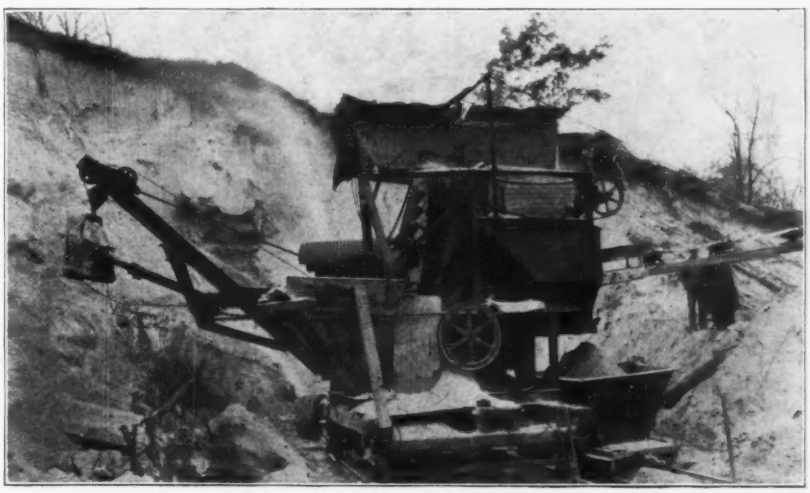
(7) The use of The France Foundry and Machine Co.'s portable power line racks every 50 or 75 feet.

Portable Pit Machine

THE ACCOMPANYING VIEW shows a home-made portable screening and loading device, developed at the sandpit of the Acme Brick Co., Barton, Wis., manufacturers of sand-lime brick.

It consists of merely a hopper into which the sand is dumped, a reclaiming bucket elevator which deposits it into a small rotary screen, underneath of which is another hopper from which the cars are loaded. The coarse material or oversize, which in this case it is desired to eliminate, goes onto a small belt conveyor situated at the discharge end of the screen. The whole mechanism in this case is operated by a 5-h.p., direct current-motor. The outfit is mounted upon a set of double, standard-gauge, home-made trucks. This device is particularly adaptable in sand-lime brick manufacture, where it is desired to get a clean sand before hauling it to storage.

Tripod for quarry power line



Screening and loading machine for sand pit

Rock and Debris Trap for Hydraulic Dredge

Device for Overcoming One of Problems of Sand and Gravel Dredge Operations

By Pierce J. McAuliffe
Manufacturers' Sales Engineer, 17 Battery Place, New York City

NEARLY EVERY HYDRAULIC DREDGE is equipped with some device to exclude large stones, piles and other undesirable objects from entering the dredging pump and the discharge line. Frequently this device takes the form of a bar placed across the suction pipe either at the suction head or at some point between the suction head and pump. The objection to this is that one stone or other large object may so congest the suction pipe as to require that the dredge be shut down to have the object removed. If the bar is placed at the mouth of the suction pipe the ladder must be raised and a man sent out in a small boat to remove the object. A small boat gives a very insecure working platform, and considerable time is apt to be lost on this account.

In some cases a trap has been arranged in the suction pipe before it enters the hull with the idea that if large objects are picked up they can be caught at this point and dropped back into the water before they enter the hull suction pipe. In soft material, when it is practicable to dig a few feet overdepth, this serves satisfactorily, but in hard material, where it is difficult to maintain even the required depth, such objects must be picked up later by a grapple dredge or by a diver before the work is finished.

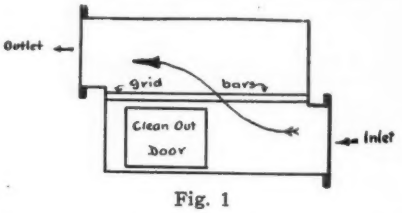


Fig. 1

With the idea of reducing these time losses a stone box was introduced several years ago and was used on quite a number of dredges. This stone box, a diagram of which is shown in Fig. 1, was simply an enlarged section of the hull suction pipe with inlet at the bottom, outlet at the top and bars across the box to stop large objects. The objections to this trap are:

1. It required that the suction enter the hull below water.

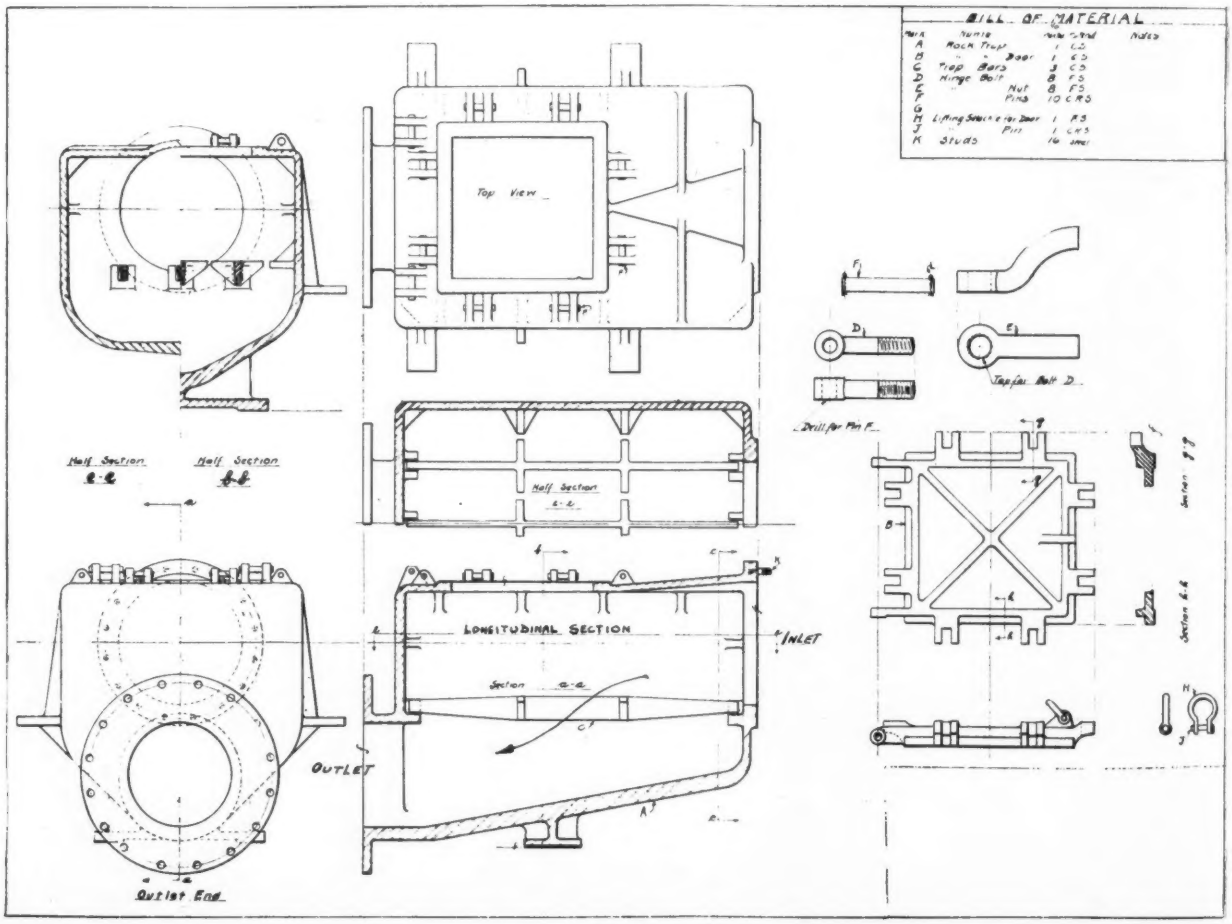


Fig. 2

2. A gate valve was necessary between the stone box and the point where the suction pipe entered the hull.

3. When the stone box was filled with rocks or debris it was necessary to close the gate valves so that the hull would not be flooded when the trap door in the stone box was opened.

4. Invariably a large amount of sand, clay or other material, which ordinarily would have passed through the pump without trouble, would be deposited in the bottom of the stone box, and this would have to be shoveled out on to the dredge hull floor to get at the large stones. This made the pit in which the box was located a very sloppy place.

5. It was often very difficult to close the gate valve fully, and water would continue to drain into the hull while the stones were being removed. Occasionally the hull was flooded to the danger point.

To overcome these objections the writer, while engineer for the Morris Machine Works of Baldwinsville, N. Y., developed a new type of rock trap which just reversed the principle upon which the original was constructed. Fig. 2 show this type. In this the inlet is at the top, the outlet at the bottom. Only such objects as are too large to be permitted to enter the pipe are retained on the grid bars, the smaller solids always being carried through with the stream. The high inlet permits the suction pipe to enter the hull above the water line.

No valve is necessary in the suction pipe, as the trap door through which the stones are removed is designed to be at about deck level, so that it is above the water level. As soon as the pump has been slowed down the trap door can be opened and the water immediately recedes so as to leave the bars exposed. The stones or other debris can be removed very easily and quickly, and a chain fall can be placed over the trap door to pull out such objects as have become wedged. There is no flooding of the hull and the dredge as a result can be kept comparatively clean. The space inside the rock trap is made so that as many as a dozen large stones can be collcted before it will be necessary to shut down for their removal. On 20-in. dredges the loss of head through this rack trap is about equal to one foot of water.

With the first method described, calling for a bar across the suction pipe, each of these stones would have made it necessary to shut down the dredge. Five minutes is the minimum delay to be expected for each stone in such a case, so that when these twelve delays are combined into one, which rarely requires more than ten minutes, the saving of time by the installation of a properly designed rock trap can be easily imagined.

The Morris Machine Works has used this trap on all of its dredges since that time, and some of the other manufacturers have adopted it as their regular practice, but the results obtained from it are so satisfactory that it undoubtedly could be used to advantage on many other dredges and hydraulic sand and gravel diggers which are still using the old method of placing the bars across the suction pipe.

Highway Contractors Discuss Material Supplies

Highway Section of the Associated General Contractors in Convention at New Orleans Opposed State and County Governments Furnishing Construction Materials

FOLLOWING is an abstract of an interesting discussion which took place at the recent annual convention of the Associated General Contractors in New Orleans.

"Mr. Peterson (Henry W. Horst & Sons, Rock Island, Ill.).—I would like to hear a discussion on the advisability of this Division going on record as opposed to the States or Counties furnishing materials that enter into a contract.

"Would it not be well to incorporate in a motion the idea that the A. G. C. is opposed to the States or Counties furnishing material? I believe that point is important, because most of the contractors have suffered more or less due to the States or Counties furnishing material. I know we have in Illinois, and although we haven't in Iowa, the reason why we have not is because we have refused to bid on jobs where the County or the State intended to furnish material, because we felt the risk in assuming the responsibility was too great. It has held us from bidding on a good many jobs. We said, 'We are not interested.'

The Material Man's Part

"Mr. McKenzie (Secretary, Iowa State Service and Highway Bureau)—Our experience in Iowa is the State has desired the contractor to buy the material, but the material man has been gouging the contractors to such an extent that they have practically entered into co-operation with the various counties to develop material, in order to get away from the prices the material men are charging. We have two counties that are doing this.

"The successful contractor has a clause in his contract that in the event the County does not furnish sufficient supplies to keep his organization free, he is free to go out and buy on the open market and assess the charges against the County. On our 157 miles of hard surface, it averages about $3.99 cents a yard. Practically every bit of that price has been caused by the exorbitant price the gravel man has charged for his material. They have advanced the price from $1.20 to $1.85 at the pit.

"Chairman Moore—If the Chair is permitted to cite an instance of that kind, bids were asked in our State for some paving in which the County was to furnish the gravel. I asked the supervisor something about the facilities they had for furnishing the gravel. They advised that they had plenty of gravel. I asked them where their pit was, and they said they were negotiating. I asked what their equipment was, and he said: 'We expect to spend $4000 or $5000 on equipment.' My bid on that job was $4.62 cents, and a new contractor's bid was $3.84. The new contractor was going to use the gravel the County would furnish.

Oppose State Furnishing Materials

"Mr. Baxter (A. Guthrie Co., Minneapolis)—I move that it be the sense of this Division that the A. G. C. be opposed to any public body furnishing any material; and where it is so furnished, the public body should pay the contractor damages for loss caused by delay.

"The motion was seconded by Mr. Hill, of Los Angeles, and carried by a vote of the Highway Division."

Interest Rate on California Road Bonds Raised to 5¼ Per Cent

THE CALIFORNIA STATE HIGHWAY finance board on Jan. 28 authorized the sale of $3,000,000 in highway bonds at 5¼ per cent. This is the first action taken by the newly created board which was formed to adjust the interest rate from time to time to suit conditions of the money market. This first block of bonds is expected to finance the first part of the 1921 construction program. Announcement has been made that bids for paving about 75 miles of state highway were received Feb. 21, this work to be financed by the bonds which it is expected can be sold at 5¼ per cent rate.

Findings in a Famous Illinois Rate Case

ATTORNEY-EXAMINER CHARLES F. GERRY, in a tentative report on No. 11490, Chicago Sand and Gravel Producers et al. vs. A. T. & S. F. et al., recommends that the Commission find that rates for the transportation of sand and gravel from the Inner Zone and Outer Zone in Illinois and Wisconsin to the Chicago switching district have not been shown to have been unreasonable and that reparation be denied.

It is further recommended in the report that the Commission find that the interstate transportation of sand and gravel is and will be subjected to undue, unreasonable and unjust discrimination to the advantage or preference of intrastate commerce unless the rates on the various commodities are adjusted as follows:

"The rates on sand and gravel from Outer Zone points on the Northwestern and the Milwaukee, from Kickapoo and Ginger Hill, from Rockford, from Fontana and from Oregon shall be 3.5 cents per 100 pounds.

"The rates on sand and gravel from Inner Zone points on the Northwestern and on the Milwaukee, from Coleman, Yorkville, Joliet, Renwick, Worth and Millsdale; on sand and refuse stone from Buckley Pit, Wilmot Spur; and on gravel from Plainfield, shall be 3.25 cents per 100 pounds, which rate shall also apply to the transportation of crushed stone from Ives.

"The line-haul carriers shall be required to absorb the charge of the intermediate carrier, but should be permitted to plus their charges by those of the delivering carrier; and that

"The rates for the transportation of crushed stone, sand and crushed slag from Harvey, McCook, La Grange, Bellewood, Gary, Thornton and South Chicago for single-line hauls to points within the district shall not be less than 2.5 cents, and for connecting-line hauls, 3 cents."—"Traffic World."

Phosphate Rock in Montana

INTEREST in the possibility of mining phosphate in the West has been revived during the last two or three years, and more or less work has been done in the Garrison, Melrose and Phillipsburg fields in Montana. Phosphate deposits near Maxville, Granite County, Montana, in the Phillipsburg field, are described by J. T. Pardee in Bulletin 715-J of the United States Geological Survey, Department of the Interior. The deposits contain a large quantity of easily accessible phosphate within a few miles of the railway. The bulletin, which contains a map and describes the deposits, may be had without charge from the Director of the United States Geological Survey, Washington, D. C.

Where Water Is a Valuable Gravel Plant By-Product

NOT EVERY sand and gravel deposit in adjacent to an adequate supply of water, although this should certainly be a prime consideration in any proposed development. In many parts of the far west, where water is considerably less plentiful than in the east and central west, sand and gravel are found in many deposits which do not need water for their preparation. But where water is necessary to properly clean the material the source and amount of water available may be the determining factor in the development.

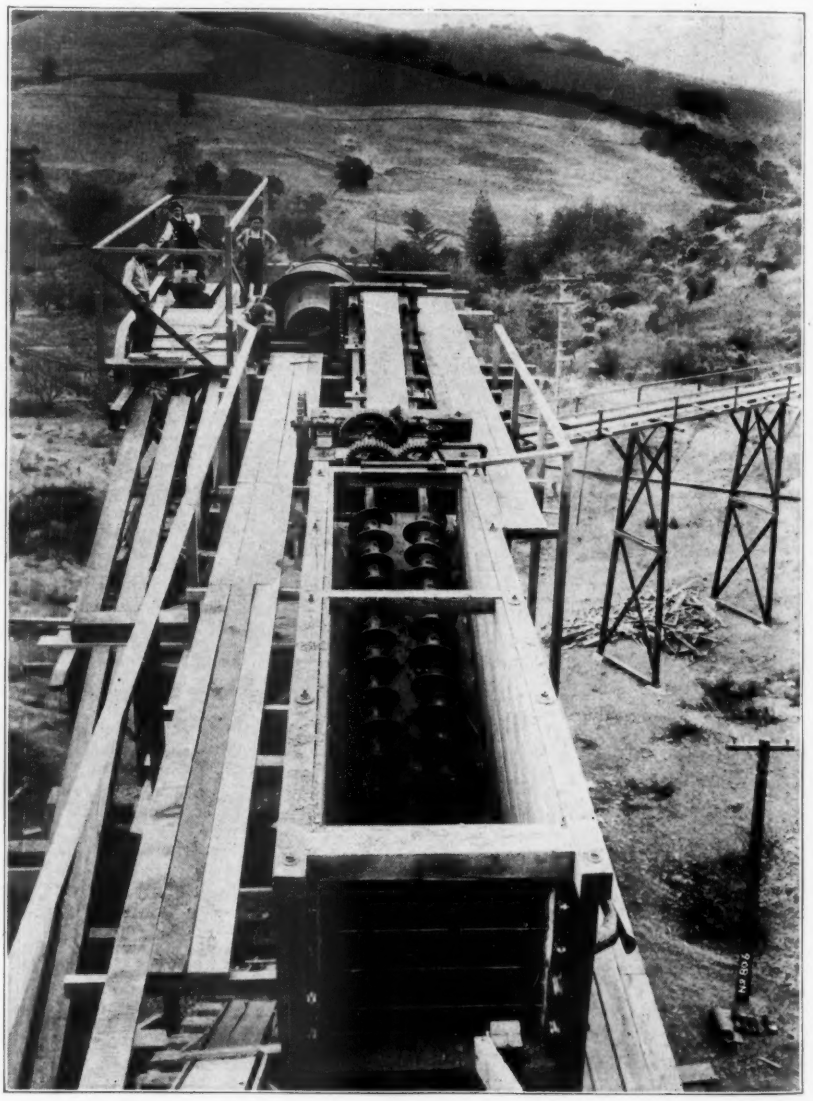
In such a case, as is illustrated herewith, the water is not allowed to go to waste, but is recovered for use again, so far as possible. The plant shown in the accompanying views is that of the Saratoga Sand and Gravel Co., Saratoga, Calif. The material handled required thorough washing with log washers, rotary screens and scrubbers.

The dirty wash water instead of being allowed to run to waste is flumed to a Dorr classifier, which is a special type of agitated settling tank, where the silt is largely removed and the comparatively clear water overflows to a collecting pond, from which it is pumped back to the washers.

The deposit apparently contains an unusual amount of fine material so that the problem is more than ordinarily difficult of solution.

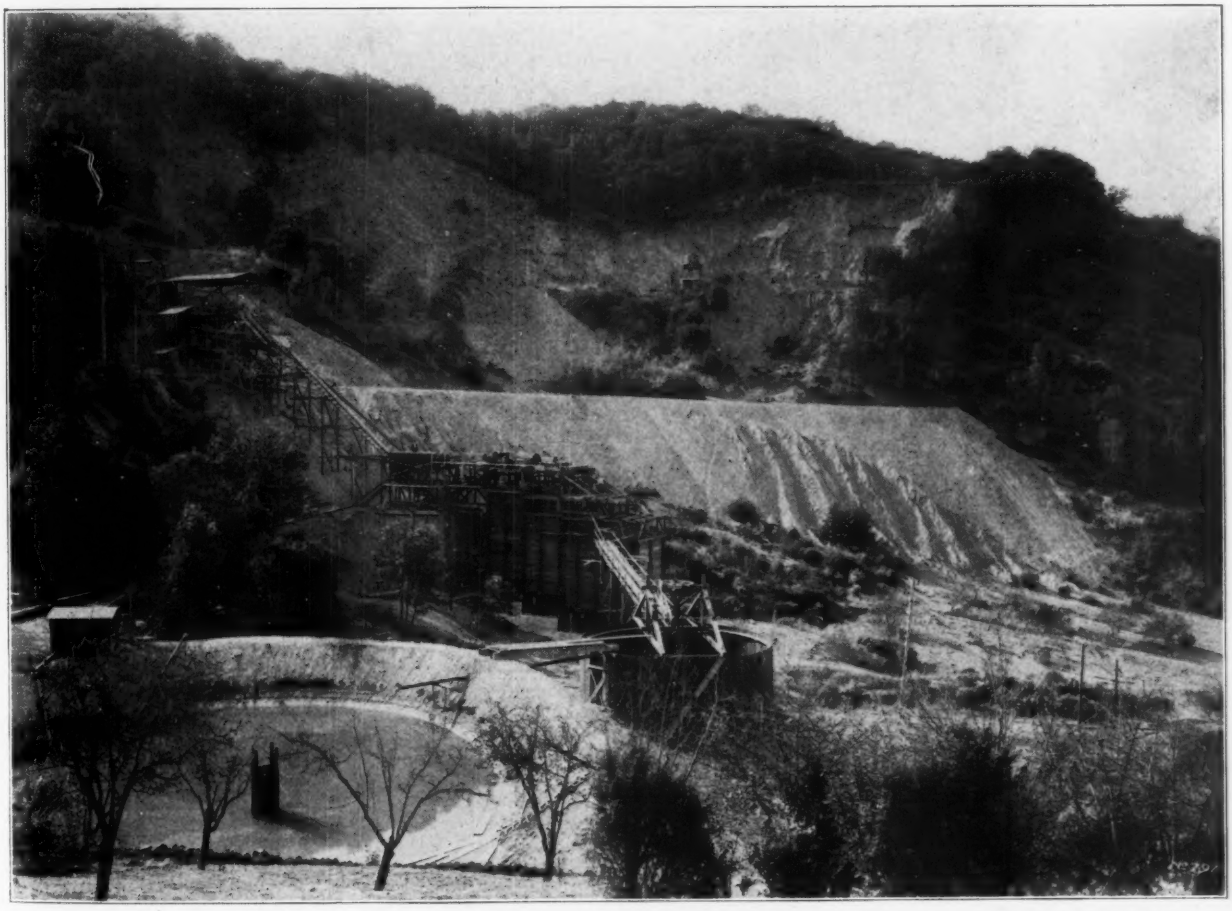
Some of these California gravels carry an appreciable amount of gold and in at least one operation, to be described in an early issue, the attempt is made to recover it as a by-product.

The plant was equipped largely by the Meese & Gottfries Co., San Francisco, Calif., who kindly furnished the views.



Washer details of the plant of the Saratoga Sand and Gravel Co., Saratoga, Calif.

General view of the Saratoga Sand and Gravel Co. plant



View from the opposite side showing wash-water pond

An Improved Pot Lime Kiln for Burning Dolomite

Firebrick-Lined Granite—Filled and Drawn by Gravity

By W. P. Bartlett
Supt., Tulare Mining Co., Porterville, Calif.

EARLY IN 1917 the Tulare Mining Co., of San Francisco, acquired a large dolomite property, near Colville, Wash. The rock was to be calcined to make milk of lime and magnesia, at three of the paper mills of the Crown Willamette Paper Co. in Oregon and Washington.

A trial calcination of 240 tons of the rock at the plant of the International Lime Co. near Sumas, Wash., developed the fact that the material spawled, or crumbled, to some extent in burning in a modern kiln.

A careful study of lime-burning methods in America, followed by an examination of the leading plants on the Pacific Coast, finally resulted in the adoption of a modification of the pot kilns of the Henry M. Cowell Lime and Cement Co., near Santa Cruz, Calif. (Described in ROCK PRODUCTS, September 25, 1920.)

A large number of these kilns have been operated profitably under conditions requiring hand-handling of both the raw and finished product for more than 50 years, and for a long time against the competition of more modern plants. It was believed therefore, by redesigning this type of kiln to avoid hand methods, a satisfactory lime kiln could be developed.

This modernized pot kiln plant is built against the dolomite cliffs, which tower 100 ft. above its supply-track. These cliffs contain dolomite stone sufficient for centuries of operation.

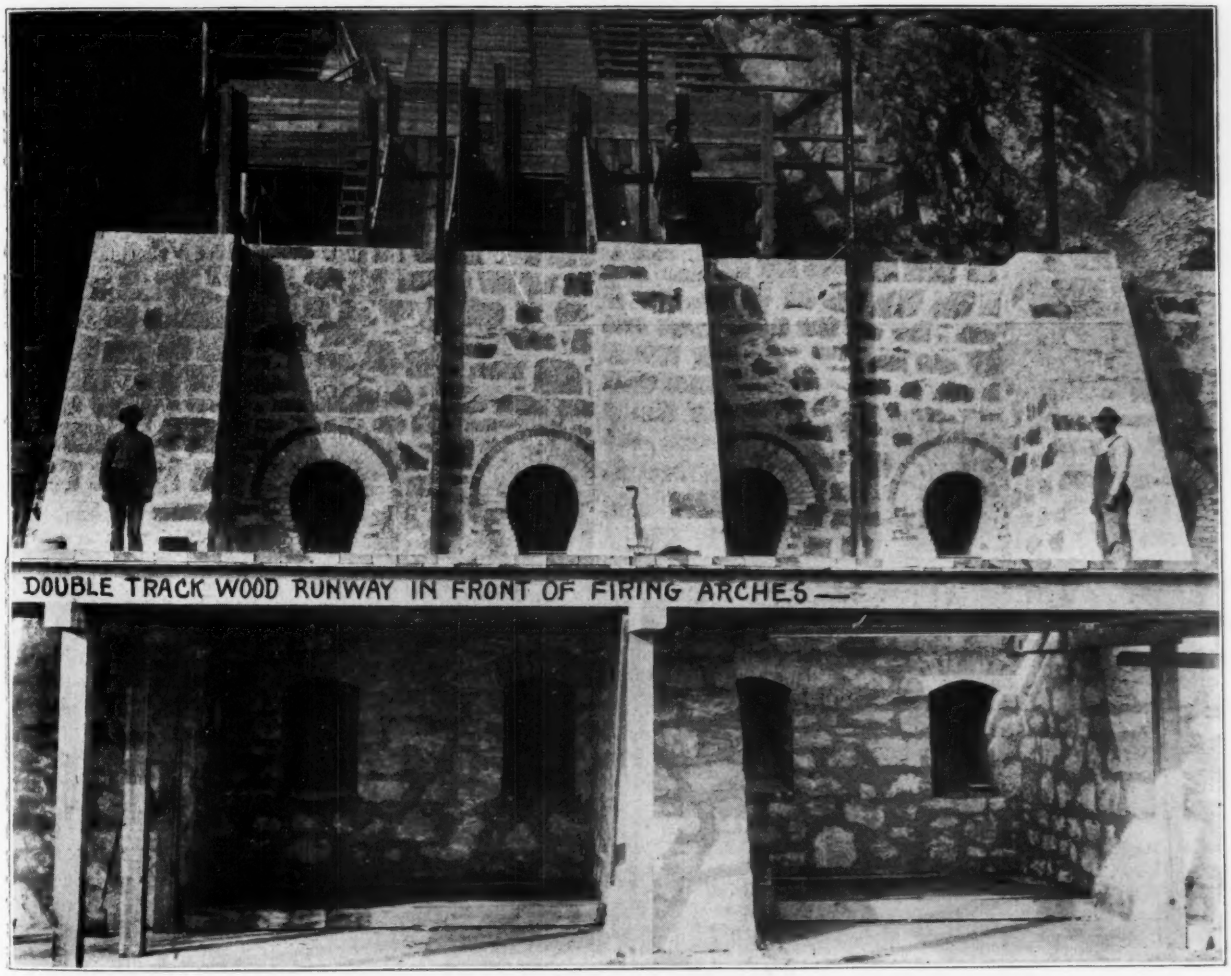
The lime plant is built of granite, with massive walls and buttresses, tied together with heavy I-beams, with steel rods anchored in the cliff. The two kilns are 14 by 26 ft. and 14 ft. deep, resting on a base 12 ft. above the warehouse floor. There are three furnaces to each kiln, burning wood in 4-ft. lengths. The flames from the furnaces enter passages in the dolomite, which is in the form of large slabs. These neither crack nor crumble under the five days' firing.

The kilns are lined with firebrick, so bonded as to retain their position without disturbance by the internal pressure from the rock. The annual cost of repairs to both kilns has not exceeded $50.

From the quarries on either side, 85 ft. above the sacking floor, kiln-charging tracks run under covered ways to a steel-bottomed covered bin. Steel chutes deliver 240 tons of stone into each kiln in a few hours by gravity. The calcined stone or lime flows down inclines from the kilns into sacks or barrels as required. Platforms are loaded with 2,200 pounds, in sacks or barrels, and transveyors load trucks in a few minutes, there being no handling of the material by hand from the quarry to the box car.

The burning requires five days, and filling, cooling and barreling nearly three days. Four burns a month, with an aver-

Dolomite quarry of the Tulare Mining Co.



Two views of the lime plant of the Tulare Mining Co. in California

age yield of 125 tons of lime to a burn, is the present capacity of each kiln. Over a long period the production of dolomite lime has averaged 1.96 tons per cord of wood and slabs burned.

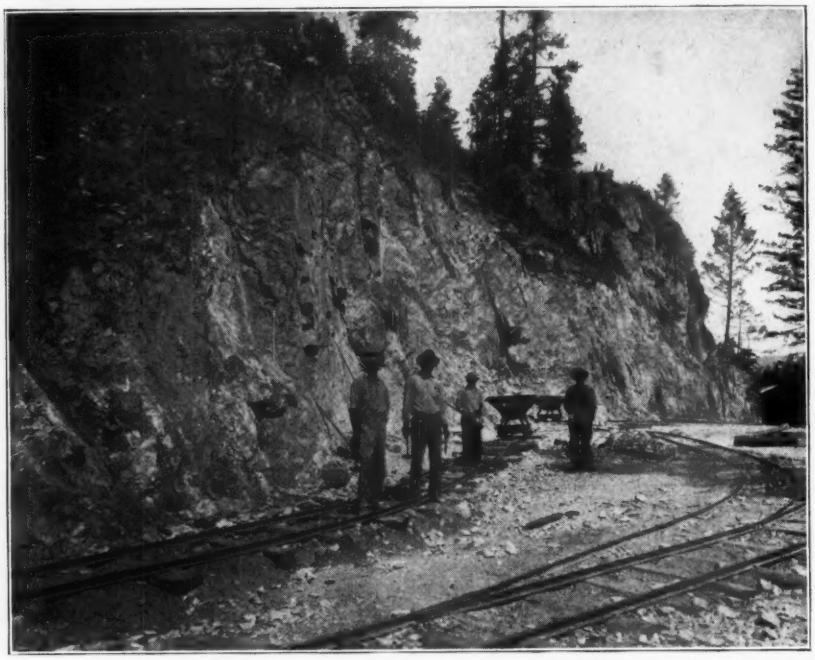
There is practically no core. The capacity has always been in excess of the paper mill requirements. During three years there have been but 75 burns in each kiln, producing about 18,000 tons of dolomite lime.

The quarry spawls are all used on top and along the walls, so protecting the granite walls that there is practically no repairing to be done. Very little smoke is produced, as the wood burns without ash. The stone in the kilns is covered over the top with sheet iron, and the fire so regulated that little heat escapes. There is practically no quarry waste.

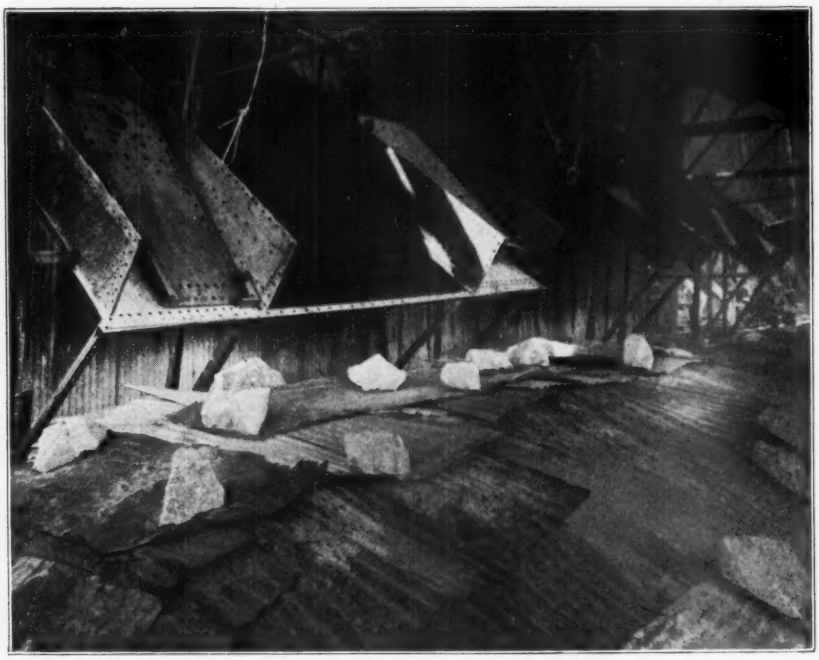
Many hundreds of assays of the calcined product give an average as follows:

	Per Cent
Ignition loss	3.00
Insolubles	3.03
FeA_1	1.50
CaO	51.00
MgO	41.47

Each bin, with the 24 quarry carloads, holds a charge for each kiln. Quarrying is done by tunneling and heavy blast methods, a 50,000-ton shot, using 7,000 pounds of low grade powder having been made on January 1st of last year. Besides the use of the product of this plant in the paper mills there is a rapidly increasing call for it to replace caustic (high calcium) lime in the building trade, the demand already extending beyond Spokane.



Another quarry view showing operating methods



Top of lime kilns during burning process

Dolomite for Refractory Brick

DOLOMITE IS RARELY, if ever, used in the manufacture of refractory brick for electric furnaces at the present time because of the difficulty encountered in preventing the lime from slaking. Several years ago such brick were made at different European steel plants, but as it was necessary to use them immediately in order to prevent their disintegration they were gradually replaced by magnesia brick.

The use of dolomite in patching and, in a few cases, for building entire bottoms has continued to the present day, probably because of its low initial cost as compared with that of magnesite. Dolomites highest in magnesia and containing about 4 per cent of iron oxide and alumina apparently have the most desirable characteristics; when over 4 per cent is present, especially when accompanied by more than 3 or 4 per cent of silica, the product is less refractory.

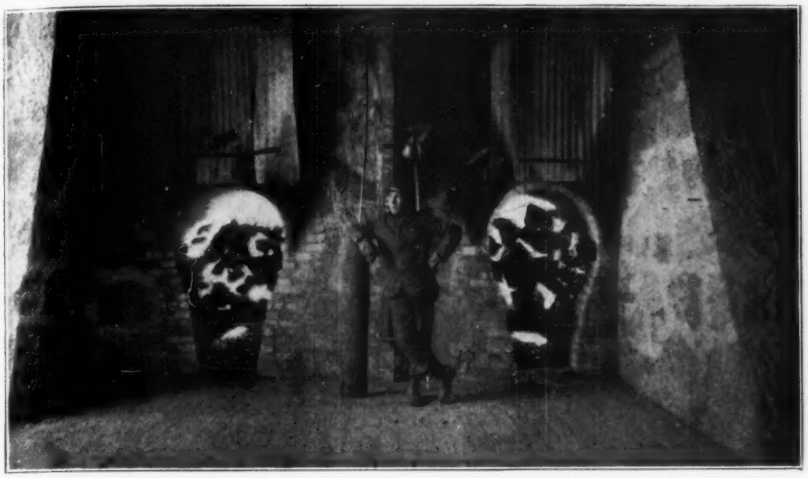
The writer has compared burned dolomites with "treated" dolomites and dead-burned magnesites and drawn the following conclusions:

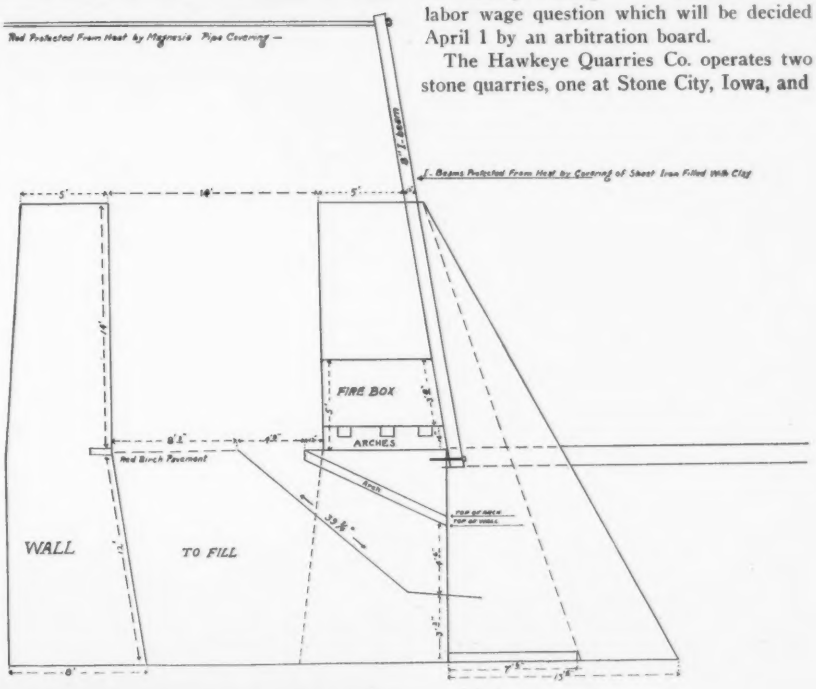
The magnesites are more resistant to slaking than the dolomites or dolomite preparations, also to the action of the corrosive mixture and that of fireclay and silica. One of the treated dolomites has a slaking tendency so low as to group it with the magnesites; in its resistance to corrosion it compares more closely with the untreated calcined dolomite high in impurities.

The materials highest in impurities and lowest in lime were most resistant to slaking.—R. M. Howe, Mellon Institute of Industrial Research, Pittsburgh, Pa.

More Proof That Fertilizers Need Help of Limestone

TESTS AT KENTVILLE, N. S., of the agricultural value of ground raw limestone on clover in ½-acre plats showed that two tons of limestone supplemented by a half ton of basic slag produced a considerably greater average increase in the hay crop than a half ton of





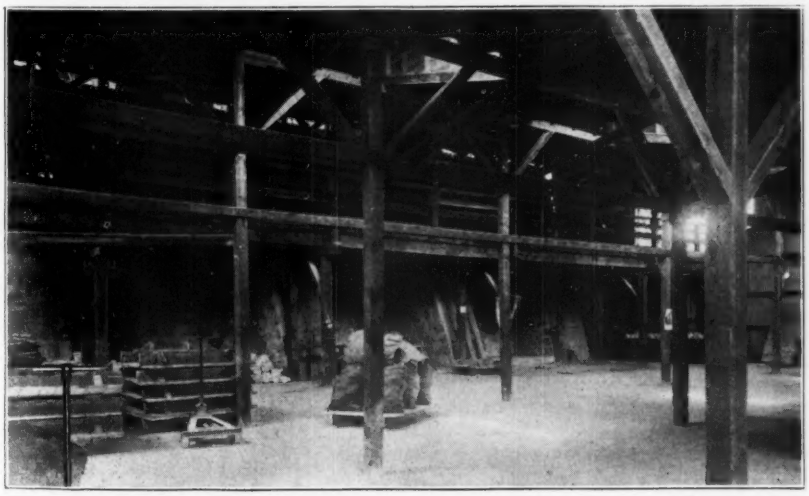
Above—Two of the lime-kiln furnaces. To right—Cross-section of granite-walled lime kiln.

slag alone and a slightly greater increase than two tons of limestone alone, according to a recently issued report of W. S. Blair, of the Canada Experimental Farms.

Tests with wheat showed a striking increase in both straw and grain when the wheat was both limed and fertilized. Liming alone gave greater increased yields than fertilizing alone.

Cement Sold at No Profit

THE MARQUETTE CEMENT COMPANY in a recent advertisement (Chicago Daily Tribune) makes the following statement: "This company is deeply interested in rendering the broadest possible service to people of this community. We recognize that only as you prosper can we prosper. For some time Marquette cement has been marketed without profit. We have kept our plant running in order that our efficient organization might remain intact. We do not want to help swell the ranks of unemployment. We have not cut wages. *We are willing to do business without profit to HELP SHORTEN THIS READJUSTMENT PERIOD—to get at the building of roads, homes, public works.*"



Packing room floor showing transveyors

Iowa Men Are Optimistic

THERE IS A VERY OPTIMISTIC outlook regarding the crushed stone industry in and around Cedar Rapids, Iowa, for 1921 according to Robert P. Green, general manager of the Hawkeye Quarries Co. of that city. Other business men predict a good year in construction work and are merely waiting for a decision on the labor wage question which will be decided April 1 by an arbitration board.

The Hawkeye Quarries Co. operates two stone quarries, one at Stone City, Iowa, and the other at Glory, Iowa. Both of these quarries were compelled to close last November on account of the car shortage and are still shut down.

During the months of March, April and May, 1920, the company enjoyed the biggest business of their history and as a contrast to this they had the worst business during the remainder of the year. From May until November the car situation was very poor so that in order to keep from losing money the quarries were compelled to stop operations.

At the present time they are stripping at the Glory quarry and repairing equipment preparatory to starting operations on March 1, 1921. The Stone City quarry will start operating about April 1, 1921. The price of quarry labor this year will be about 30 per cent lower than last year.

Portland Cement in 1920

Production Was 100,000,000 Barrels—Largest in the History of the Industry

IN THE PRODUCTION, shipment, and gross value of Portland cement, 1920 was a record year, according to estimates prepared under the supervision of Ernest F. Burchard, of the United States Geological Survey, Department of the Interior. The production is estimated at 100,302,000 barrels, and the shipments at 96,329,000 barrels, valued at $193,548,000, compared with 80,769,378 barrels manufactured and 85,596,616 barrels, valued at $146,656,076, shipped in 1919, an increase of 24 per cent in production, 13 per cent in shipments, and 31.9 per cent in value of shipments in 1920. The stocks of finished cement increased from 5,852,497 barrels at the end of 1919 to about 8,290,000 barrels at the end of 1920, or more than 41 per cent. The average factory price in bulk at the mills for the whole country was $2.01 a barrel in 1920, compared with $1.71 in 1919, an increase of 17.5 per cent.

The statistics for 1920 include reports from practically all manufacturers of Portland cement and are based on records for the first 11 months plus estimates for December. Some of the estimates for December may have been too large, so that when the final returns for 1920 are received the actual production and shipments may prove to be slightly lower and the stocks on hand slightly greater than the figures here given.

The statistics for 1919 presented herewith were collected by the Geological Survey in co-operation with the Bureau of Census and may also be subject to slight revision. The estimates by the Geological Survey for 1919, published in February, 1920, came very close to these figures, the estimated production and shipments of Portland cement being respectively 0.6 per cent and 0.13 per cent low.

There were 115 plants that manufactured Portland cement in 1920, compared with 111 active plants in 1919, one additional plant each having operated in Alabama, Indiana, New York, and Oregon.

The production of cement was materially curtailed during the war, and after the armistice was declared the expectation of lower prices slackened building operations during the first half of 1919. The demand for cement was therefore so slow that production was held down below normal. Finally the "underbuilt" condition of the country forced building in spite of high prices, causing a demand for cement that resulted in a shortage of it late in 1919. The stocks dropped from about 10,500,000 barrels at the beginning of 1919 to less than 6,000,000 barrels at the end of that year.

At the beginning of 1920 there was the usual lull in building operations that comes in winter, but the production of cement was more active than a year earlier and continued to rise until it reached the peak in October. During the last two months of 1920 there was a decline in activity after the building season had passed. The stocks at the beginning of 1920 were lower than at the beginning of any other year since records have been kept by the United States Geological Survey; for four or five months they gained slowly, but from May until October they dwindled rapidly, almost vanishing at some plants. In November and December the production was not curtailed in proportion to the decline in demand, and stocks once more began to accumulate, so that at the end of the year more than a month's supply was becoming seasoned for use in 1921.

When future demand and price are uncertain the accumulation of large stocks of cement in winter at current costs becomes a serious problem, for though it

Portland cement produced and shipped in the United States, 1919 and 1920, by States.[a]

State.	Production.					Stock (barrels).	
	Active plants.		Quantity (barrels).		Percentage of increase 1920.		
	1919	1920	1919	1920		1919	1920
California	8	8	4,642,679	6,995,000	51	431,355	372,000
Illinois	4	4	4,206,918	5,638,000	34	18,125	441,000
Indiana	5	6	7,262,454	10,700,000	47	435,985	909,000
Iowa	4	4	3,573,278	4,813,000	35	126,162	487,000
Kansas	7	7	2,927,270	4,301,000	47	220,994	343,000
Michigan	11	11	4,675,244	4,808,000	3	210,404	588,000
Missouri	5	5	5,216,347	6,039,000	16	160,123	514,000
New York	8	9	4,383,579	5,940,000	36	711,504	494,000
Ohio	5	5	1,637,418	1,790,000	9	82,614	182,000
Oklahoma	3	3	1,354,130	1,552,000	15	88,452	112,000
Pennsylvania	21	21	25,325,173	28,365,000	12	2,429,034	2,330,000
Texas	5	5	2,249,735	2,509,000	12	205,918	101,000
Utah	3	3	819,861	1,060,000	29	34,295	73,000
Washington	4	4	1,393,907	2,290,000	64	196,393	222,000
Other States[b]	18	20	11,101,385	13,502,000	22	501,159	1,122,000
	111	115	80,769,378	100,302,000	24	5,852,497	8,290,000

State.	Shipments.					Average factory price per barrel.	
	1919		1920				
	Quantity. (barrels).	Value.	Quantity. (barrels).	Value.	Percentage of change in quantity.	1919	1920
California	4,743,336	$8,860,196	6,920,000	$15,932,000	+46	$1.87	$2.30
Illinois	4,873,831	7,901,689	5,205,000	9,439,000	+ 7	1.62	1.81
Indiana	7,667,976	12,527,770	10,245,000	18,910,000	+34	1.63	1.85
Iowa	4,569,110	7,798,347	4,437,000	8,676,000	− 3	1.71	1.96
Kansas	3,023,901	5,467,284	4,165,000	7,773,000	+38	1.81	1.87
Michigan	4,990,308	8,468,196	4,426,000	10,785,000	−11	1.70	2.44
Missouri	5,496,164	9,264,017	5,671,000	11,231,000	+ 3	1.69	1.98
New York	4,441,250	7,700,406	6,049,000	11,971,000	+36	1.73	1.98
Ohio	1,821,597	3,311,179	1,691,000	3,724,000	− 7	1.82	2.20
Oklahoma	1,350,601	2,578,571	1,527,000	3,280,000	+13	1.91	2.15
Pennsylvania	26,250,077	43,126,528	27,669,000	52,349,000	+ 5	1.64	1.89
Texas	2,318,747	4,226,222	2,639,000	5,797,000	+14	1.82	2.20
Utah	935,305	1,906,816	1,021,000	2,290,000	+ 9	2.04	2.24
Washington	1,402,616	2,868,599	1,810,000	4,462,000	+29	2.05	2.47
Other States[b]	11,711,797	20,650,256	12,854,000	26,929,000	+10	1.76	2.09
	85,596,616	146,656,076	96,329,000	193,548,000	+13	1.71	2.01

[a] Statistics for 1920 are estimates and subject to revision.
[b] Other States: Alabama, Colorado, Georgia, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oregon, Tennessee, Virginia, West Virginia.

might be desirable to have large stocks on hand ready for a possible spring demand, the uncertain conditions of the market during the last few years have caused a lack of confidence in the future. Aside from market conditions, many other factors vitally influence the cement industry; since the end of the war transportation facilities have remained inadequate both for raw materials and for finished products, and the supply of coal and labor has been short, and when these conditions prevail during the building season the result is a shortage of cement, which naturally raises the factory price somewhat and gives opportunity for dealers to increase greatly the price to the consumer.

The conditions were generally better in 1920 than in 1919, though most plants felt the cessation of demand and lowered prices at the end of the year. The prevalent handicaps, especially labor troubles, proved too great for some plants, which were closed for long periods. About half a dozen widely separated plants reported conditions about the same as in 1919.

There were increases in production and in the average selling price of Portland cement in every State and district. Although there were decreases in shipments in three districts and in three States, ranging from 2 to 11 per cent, the gross value of shipments in all States and districts increased. The increases in production ranged from 1 per cent in the Tennessee-Alabama-Georgia district to 64 per cent in the State of Washington. The lowest average price reported by any group of plants in 1920 was $1.77 a barrel in the Illinois-western Indiana district, and the highest average price was $2.47 in Washington. These prices compare with $1.62 and $2.05 in 1919 in the same localities.

Market prices on Portland cement in carload lots in bulk, as quoted by the "Engineering News-Record," ranged in January, 1920, from $2 a barrel at Chicago to $3.12 at Denver. These may be compared with quotations of $3.05 and $3.67, respectively, in January, 1919. In Chicago prices remained steady at $2 until June, when they advanced to $2.15, and in October they reached $2.35. In Denver the price of $3.12 in January gave way to $2.82 in March, but in July there was a sudden increase to $3.80, followed in October by a reduction to $3.25. Quotations at San Francisco and Dallas were generally intermediate between those at Chicago and Denver. The average wholesale prices of cement per barrel in New York by months during 1920, according to Dun's Review, were as follows: January, $3.37; February, $3.40; March, $3.40; April, $3.56; May, $4.33; June, $4.58; July, $4.80; August, $5.10; September, $5.06; October, $4.98; November, $5.10; and December, $4.92.

In the calendar year 1920 498,036 barrels of cement of 380 pounds were imported into the United States, valued at $1,229,431 or $2.47 a barrel. The exports during the same period amounted to 2,985,867 barrels, valued at $10,045,369 or $3.36 per barrel. The exports for the year 1920 exceeded the exports of 1919 by 522,118 barrels. The exports were largest in March, 369,640 barrels, and least in July, 156,713 barrels. The figures showing the imports and exports were compiled from the records of the Bureau of Foreign and Domestic Commerce, and are subject to revision.

The accompanying tables show by States and by districts the actual production, shipments, value and stocks of Portland cement for 1919 and estimates of the same items for 1920.

New Lime Periodical

THE NATIONAL LIME ASSOCIATION, Mather Bldg., Washington, D. C., has started the publication of a monthly, "Construction Lime News." This is gotten up in attractive style and is designed to furnish architects and engineers with first-hand information in regard to the use of lime in construction.

The first issue, January, 1921, contains a number of interesting articles, one in particular emphasizing the value of hydrated lime in cement stucco. Two articles give quite a little history of the use of lime from ancient to modern times.

Portland cement produced and shipped in the United States, 1919 and 1920, by districts.

District.	Production.					Stock (barrels).	
	Active plants.		Quantity (barrels).		Percentage of increase, 1920.		
	1919	1920	1919	1920		1919	1920
Lehigh district (eastern Pennsylvania and New Jersey)	20	20	22,747,956	25,448,000	12	2,272,911	1,982,000
New York	8	9	4,383,579	5,940,000	36	711,504	494,000
Ohio and western Pennsylvania	8	8	6,599,820	7,454,000	13	347,438	775,000
Michigan and northeastern Indiana	12	13	5,047,395	5,303,000	5	264,404	639,000
Southern Indiana and Kentucky	3	3	2,490,497	3,213,000	29	99,626	252,000
Illinois and western Indiana	6	6	9,088,081	13,190,000	45	302,724	1,087,000
Maryland, Virginia, and West Virginia	4	4	2,469,768	3,050,000	23	100,193	246,000
Tennessee, Alabama, and Georgia	4	5	2,744,646	2,764,000	1	37,235	227,000
Iowa, Missouri, and Minnesota	10	10	10,038,625	12,396,000	23	366,193	1,140,000
Nebraska, Kansas, Oklahoma, and central Texas	15	15	6,142,538	8,072,000	31	476,909	576,000
Colorado, Utah, Montana, and western Texas	8	8	2,811,843	3,765,000	34	221,119	226,000
California, Washington, and Oregon	13	14	6,204,630	9,707,000	58	652,241	646,000
	111	115	80,769,378	100,302,000	24	5,852,497	8,290,000

District.	Shipments.					Average factory price per barrel.	
	1919		1920				
	Quantity (barrels).	Value.	Quantity (barrels).	Value.	Percentage of change in quantity.	1919	1920
Lehigh district (eastern Pennsylvania and New Jersey)	23,501,560	$38,511,273	24,984,000	$47,735,000	+ 6	$1.64	$1.91
New York	4,441,250	7,700,406	6,049,000	11,971,000	+36	1.73	1.98
Ohio and western Pennsylvania	7,102,442	12,144,272	6,947,000	13,482,000	− 2	1.71	1.94
Michigan and northeastern Indiana	5,459,439	9,274,025	4,920,000	11,986,000	−10	1.70	2.44
Southern Indiana and Kentucky	2,640,556	4,405,939	3,083,000	6,339,000	+17	1.67	2.06
Illinois and western Indiana	9,932,158	16,092,758	12,409,000	21,916,000	+25	1.62	1.77
Maryland, Virginia, and West Virginia	2,613,963	4,517,591	2,911,000	6,087,000	+11	1.73	2.09
Tennessee, Alabama, and Georgia	2,830,588	4,952,245	2,580,000	5,668,000	− 9	1.75	2.20
Iowa, Missouri, and Minnesota	11,440,645	19,314,646	11,593,000	22,423,000	+ 1	1.69	1.93
Nebraska, Kansas, Oklahoma, and central Texas	6,292,741	11,583,736	7,981,000	16,161,000	+27	1.84	2.02
Colorado, Utah, Montana, and western Texas	2,982,048	5,939,933	3,748,000	8,244,000	+26	1.99	2.20
California, Washington, and Oregon	6,359,226	12,219,252	9,124,000	21,536,000	+43	1.92	2.36
	85,596,616	146,656,076	96,329,000	193,548,000	+13	1.71	2.01

Use of Silica and Other Mineral Fillers in Paints

Properties of Materials Necessary for This Growing Use of Quarry Products

By F. P. Ingalls
Chemist, John W. Masury & Son, Manufacturers of Paints and Varnishes, Brooklyn, N. Y.

Introduction

THIS IS THE FIRST of a series of articles by a foremost authority on paint manufacture. ROCK PRODUCTS readers are particularly fortunate to have such a series of articles by the highest authority on the subject of mineral fillers in America; and, so far as the editor can determine, this is the first comprehensive treatment of the subject in the English language. Undoubtedly, Mr. Ingalls will be glad to answer any questions raised by readers, if such queries are sent through the editor.—The Editor.

SILICA OCCURS NATIVE in at least three forms, crystalline, vitreous, and amorphous. Of each of these forms there are numerous varieties. Of the amorphous varieties a number are hydrated, i.e., they give off water when heated, even though they have been previously dried at 220 deg. F. The different kinds vary both in hardness and a certain rough feel frequently called "tooth."

From the paint-maker's viewpoint, however, silicas divide themselves more or less readily into two main classes, "hard" and "soft." The hard silicas include the crystalline and vitreous kinds, such as powdered quartz and flint, while the soft include the amorphous forms, especially those which have been produced by the weathering of rock, by deposition from solution, and fossil remains.

The use of hard silica alone is practically confined to the type of paint known as "paste wood filler," although considerable quantities are used in other paints, generally admixed with other pigments. The soft kinds are also used in wood fillers, especially when marketed in ready-mixed form, chiefly because they remain in suspension better; in general they may also be used as an "inert extender" in nearly all kinds of paint where inert extenders are desirable. This phase of the subject will be referred to again later.

The Why of Silica in Wood Fillers

The selection of quartzose silica as the pigment for wood filler was originally an empirical discovery, the result of long experience in trying out different substances, but scientific study shows that there are four fundamental properties which, occurring together in one substance, render it especially adaptable for this type of paint. These properties are: first, that it is plentiful in a very pure state, free from color; second, it is highly inert, showing no evident tendency to reaction with any kind of vehicle which is used in paint; third, it has a refractive index which is very near that of most paint vehicles; and fourth, being crystalline or non-porous, it has a relatively small specific surface when reduced to powder and consequently requires a minimum volume of fixed vehicle or "binder" to hold it in place. As a corollary to the first it is cheaper than any vehicle it is liable to be mixed with, thus reducing the cost of the paint while at the same time furnishing an element of paramount value.

To understand clearly why these properties are valuable it is first necessary to consider a little the process of varnishing an open-grained wood like oak. As the wood is very porous, the first coat does not dry with a gloss, but sinks in, and as the grain is more porous than the flashes, the penetration is very uneven, thus leaving an uneven surface. The second coat may or may not dry with a uniform gloss, this being dependent upon the particular piece of wood in hand, but the unevenness of the surface will persist up to three or four coats. This necessitates the application of several coats of rubbing varnish with not less than 24 to 30 hours between coats—an expensive and time-consuming process.

On the other hand, if the first coat contains enough sharp angular silica, the silica enters and blocks up or bridges over the larger pores, but does not prevent the capillary penetration of the liquid vehicle into the finer pores, and thus all the pores both large and small, are effectively stopped up. In the best practice it is customary to apply this first coat somewhat thick, or "full," and, after allowing due time for penetration, wipe off the excess before the coat has fairly "set." This removes most of the coat from the flashes, and mechanically forces the silica all the more firmly into the rough or open areas. When dry, the resulting surface is usually quite even, non-absorptive, and ready for the rubbing varnish, of which not more than two coats and often only one will be necessary before proceeding to apply the finishing coats with every assurance of a first-class result. The process may be varied, and different painters follow different modifications, but we have room here for no more than a rough sketchy outline which will enable us to understand what follows.

Necessary Properties of Fillers

Taking up the properties in order, the first, or absence of color, is important because it enables us to finish wood in its "natural" color; if we want stain we can put it in and keep it under control. The second, or absence of reactivity with the vehicle is important because it prevents the formation of variable and difficultly controllable compounds which would make the action of the filler variable and uncertain, and further, it enables us to control and adjust the character of the vehicle in hardness, drying speed, and other features, without complication due to pigment. The third, or refractive index, lies at the bottom of transparency and may be illustrated by a simple experiment. Let two tubes (glass) of small diameter be partially filled, one with powdered quartz, the other with zinc oxide; both will look alike and appear to contain a quantity of white opaque powder. If the tubes be then filled up with turpentine, shaken, and allowed to settle, there will be a marked difference in appearance, the one containing the silica will have become almost translucent while the one with the zinc will remain white and opaque as before.

The refractive index of quartz is about 1.53 and of turpentine 1.47, while that of zinc is up around 2.00. If the turpentine and quartz refracted light to exactly the same extent the mixture would be transparent. The difference is so small, however, that, in thin coats of the thickness of average paint coats (from two to five one-thousandths of an inch), the coat of filler is practically transparent and invisible if it contain no pigment except hard silica. Therefore, although

it does not cloud or obscure the grain, it has the advantage of containing a maximum proportion of pigment.

This brings us to the fourth property, the angular impermeable particles, by virtue of which a maximum volume of pigment may be secured. The importance of this feature demands a little explanation aside from the fact that such particles pack closer than spherical or rounded ones. The best filler vehicles are a rather good sort of varnish, containing a certain amount of volatile thinner and good drying oil, whatever sort or proportion of gum or resin may also be present. Such vehicles dry as the combined effect of both evaporation and oxidation, and in thus drying undergo three distinct changes in volume. The first, due to loss of thinner, needs no extended comment, since obviously any coat carrying 25 per cent by volume of thinner will after evaporation only be about three-fourths as thick as when applied. Far more important are the two volume changes occurring during oxidation. First, for a time measured by hours, but variable with the drying speed, there is an accompanying increase in both weight and volume, and while it is not definitely known that both become maximum at the same time, they apparently run more or less parallel at least up to time when the coat may be called dry to touch. From this point onward there is a gradual decrease in weight and volume which may extend over many months.

It is this slow contraction of the vehicle which especially demands our consideration because it may result in cracks if not corrected. The addition of sharp silica to such a shrinking substance has a mechanical effect similar to the addition of sand to mortar, or aggregate to concrete; first, it reduces the total amount of shrinkage in proportion to the volume of silica present, and second, it causes the internal contractile strains to be distributed over the mass instead of opening up cracks locally. The advantage of a large proportion of transparent pigment in such a filler coat is obvious.

In the very close-grained woods where the pores are very small, the silica is not so necessary; its value increases with the size of the holes to be stopped up.

Limitations of Silica Filler

The same property, however, that makes silica so good from one point of view introduces serious limitations from another, for such pigment particles in a thin liquid vehicle settle rather freely and closely in the bottom of the container. This renders it impracticable to put up such goods in ready-mixed form, and consequently such wood fillers are put up in paste form and must be thinned on the job. This type of paste wood filler, however, has been in successful use for more than a generation and has been held in high esteem.

In the use of soft silicas the field is much larger, not only because they are frequently used in wood fillers in conjunction with the hard sorts with the idea of securing the advantages of both, but also because they may be used freely in other kinds of paint consumed in much larger quantities.

To obtain any adequate idea of the use of silica in this larger field it is necessary to include that whole class of pigments known as inert extenders, of which silica itself is but a single member. Without attempting to enumerate all of them, the more common ones are:

Other Common Mineral Fillers

Calcium carbonate (Limestone) in several forms, such as

- Whiting
- Mineral primer
- Precipitated chalk
- Marble flour
- Metro-nite (trade name for a kind of powdered dolomite).

Calcium sulphate (Gypsum) in several forms, such as

- Gypsum and terra alba (which are fully hydrated)
- Dead burnt (which has been wholly dehydrated)
- Plaster (partially dehydrated and met with only infrequently)
- Satin white (met with mostly as a lake base).

Barium sulphate (Barytes) in two forms, such as

- Barytes (powdered "heavy spar")
- Blanc fixe (precipitated from solution)
- Blanc fixe (with alumina in lakes).

Barium carbonate, almost wholly met with as a lake base.

Silica, in the forms already mentioned.

Silicates, in numerous forms, such as

- Kaolin
- China clay
- Talc
- Asbestine (trade name for a variety of talc)
- Pumice
- Slate flour
- Aluminum flake (trade name)
- A number of others under different brands and of variable composition and character.

It will be noticed that most of these are white or not much colored; that they have little staining power or opacity in oil vehicles; that they are quite plentiful; and that, except for powdering, they require no extensive or complicated process of manufacture to prepare them for market and are consequently cheap as compared with the highly-colored pigments in use.

When any of these "inerts" are manufactured into paint without the admixture of any colored pigment, such paints do not in general show any extraordinary durability; in fact, such durability as they show seems to depend mostly on the vehicle. On the other hand, it is well known that many of the colored pigments exercise a profound influence in prolonging the life of paints made from them with a given vehicle. (See reports on the Atlantic City Steel Test Fence in the Proceedings of The American Society for Testing Materials).

(To be continued)

Developing Idaho's Phosphate Deposits

SEVENTY MEN are employed at the present time in the development of the Anaconda Copper Mining Co.'s phosphate deposit at Soda Springs, Idaho, to which point a branch line of the Union Pacific has been constructed, eight miles of road building. Power connections have been made and the driving of two tunnels now is under way to open phosphate beds at a depth of about 200 feet, with these two workings about half a mile apart. A crushing plant will be installed for the crushing of such rock as will be shipped in its crude state to plants other than at Anaconda for treatment. In the preparation of its own product the phosphate rock as it is broken down will be shipped to the Washoe works of the Anaconda and there converted into fertilizer by treatment with sulphuric acid, two tons of the latter being used to one ton of phosphate rock.

To Treat 1,000 Tons Daily

It is planned to ship around 1,000 tons of rock daily to the Washoe works, and to expedite this work the Anaconda already has two locomotives on the ground. has completed its "Y" tracks and shortly will commence the building of a 3,000-ton bin. Within three months the company is planning to be able to ship crude phosphate rock and perhaps a fair-sized tonnage of the prepared fertilizer. It has formed the Western Phosphate Co. and its selling organization thus far has sounded out the trade with very promising results.

Indicated tonnage of phosphate rock is said to approximate 200,000,000 according to circles believed to be in touch with the Anaconda, and a supply of copper ore adequate for 100 years is assured.

Practical Chemistry for Lime and Cement Manufacturers

Other Chemical Elements—Chlorine and Its Relation to the Industries

By Richard K. Meade, M. S.
Consulting Chemical and Industrial Engineer, 11-13 Fayette Street, Baltimore, Md.

AN IMPORTANT FACT in connection with the study of the chemical elements is the systematic way in which they group themselves together according to their chemical properties, atomic weights, etc., into families. Thus we have the chlorine family which consists of this element and also bromine, iodine and fluorine. All the members of this family showed marked characteristics of the family. We also have the sulphur family comprising besides sulphur, oxygen and the rare elements selenium and tellurium; and the sodium family consisting of sodium, potassium, lithium and several rare elements. A family of particular interest to my readers is the *calcium* family comprising the metals calcium (lime is calcium oxide) strontium and barium. These families will all be described as we go further in this series.

Chemical Relationships

There is also a very striking relation between the properties of the elements and their atomic weights. Thus if we write the three members of the chlorine family most closely related in chemical properties, in the order of their atomic weights, we will find that the atomic weight of the second element is almost exactly the mean or average of the other two.

Chlorine	35
Bromine	80
Iodine	127

If we arrange the sodium family in a similar way the atomic weight of sodium will be found to be the mean of the other two most closely related elements.

Lithium	7
Sodium	23
Potassium	39

In the case of calcium family, the atomic weight of strontium is almost the mean of that of calcium and barium.

Calcium	40
Strontium	87
Barium	137

These relations persist throughout the list of elements and the great Russian chemist Mendeleeff arranged the elements in a systematic table in which the marked relationship between chemical properties and atomic weights is shown. When Mendeleeff first drew up his table certain gaps existed and it was predicted that elements would be discovered at some future date which would not only fill these gaps but that they would have atomic weights of 44, 69 and 72 respectively and certain clearly defined properties. These predictions were verified in the discovery of the elements scandium, gallium and germanium.

It is evident from this that the properties of the elements are determined by their atomic weights. There are still some gaps in the table. Thus there is no element with an atomic weight of 100. If such an element is discovered, it must be a member of the chlorine family, have a valence of one like chlorine and the other members of this family and properties intermediate between bromine and iodine, etc.

It will be seen from the above that one of the beauties of science is the orderly and regular way in which it classifies facts and the systematic way in which matter and forces are arranged. Thus in appearance there is no resemblance between the circle and the triangle yet mathematics relates the two, the apple falling from the tree and the stars moving in their courses obey the same law, while the spark from the cat's back and the lightning in the sky are each manifestations of the same force.

Chlorine

The members of the chlorine family are often known as the halogen family from a Greek word meaning "the sea" as these elements all occur in sea-water.

Chlorine the most important member of the family is a greenish yellow gas with a disagreeable odor, causing irritation and inflammation of the nasal and throat passages. It is slightly soluble in water and is about two and one-half times as heavy as air. Chlorine does not occur free in nature but does occur widely distributed in the form of sodium chloride, NaCl, or common salt. It is also found in combination with other metals potassium, magnesium, calcium and silver forming in each case a chloride of the metal—KCl, $MgCl_2$, $CaCl_2$ and AgCl.

Chlorine is widely used in the arts and also was the first war gas used by the Germans, but was quickly superseded by more efficient ones. In the manufacture of many of these, however, chlorine was used. It is also an important raw material of the dye industry.

Chlorine is an extremely active element and combines very readily with many other elements. It decomposes many compounds and particularly organic substances, i.e., those substances which are formed as the products of animal or vegetable life. This latter action causes it to bleach or destroy the color of organic substances and to kill bacteria. One of the most important industrial uses of chlorine is to bleach. It finds large use in the paper industry for bleaching wood pulp and in the textile and laundry industries for bleaching cotton and fabrics. It is also an important disinfectant and germicide.

Hydrochloric Acid

Hydrogen forms with chlorine an important acid—hydrochloric acid, HCl. This acid is also a gas but one which is very soluble in water and this solution is the hydrochloric acid of commerce, commonly called *"muriatic acid."* Hydrochloric acid forms with the bases a series of salts called the chlorides.

Chlorine is most generally now prepared by the decomposition of a solution of sodium chloride, salt, NaCl, by the electric current—chlorine,. hydrogen and sodium hydrate being formed, according to the reaction.

$$NaCl+H_2O=Cl+H+NaOH$$

Large quantities of chlorine are thus made at points like Niagara Falls, where electric current is cheap, and the gas liquefied and shipped in steel drums to various parts of the country for use.

(To be continued)

Limestone and Acid Phosphate Profitable in North Carolina

THAT CROP YIELDS are increased and the cost of production materially lowered by using pulverized limestone in combination with acid phosphate or other commercial fertilizers is the opinion expressed by agricultural experts of North Carolina, following experiments at the agricultural stations in that state. Under the wheat crop limestone in combination with fertilizer gave an increase of an average of $18.23 an acre more than was secured with the fertilizer without the lime.

At another experiment station, pulverized limestone in combination with acid phosphate, nitrogen and potash increased the clover hay over six times the production secured from the fertilizer without the lime.

Agricultural Limestone Coming Into Its Own

How a Limestone Producer and Promoter Convinced Himself of the Efficacy of Agricultural Ground Limestone

By W. S. Halladay
Manager of Soils Bureau, Wisconsin Limestone Co., Waukesha, Wis.

IN THE COURSE of a year's work you meet with all kinds of argument relative to agricultural limestone, and before one has followed the work for long, if you are really interested in the progress of better agriculture, as well as the manufacture of agricultural limestone, you are forced to recognize the following important problems:

First: What functions does limestone perform in the soil? Second: What must constitute a perfect agricultural limestone? Third: What condition must be proved?

You first of all realize that this condition makes it necessary that you be willing to put your best effort into the work, and spend the time necessary to work out each point, and prove by actual test the value of different materials, and the result of the same in actual work.

It was some years before I realized the conditions, decided to stay with the work, and stand or fall by proved tests, but I am pleased to say that in 1920 facts have been proved, not only to my satisfaction, by my own efforts, but the results were recognized and acknowledged by soil experts, so we are still standing.

I will try and review the work in as brief a way as possible, and also give you some reasons why it was necessary for the facts to be proved that agricultural limestone might receive justice in the reclaiming of depleted soils.

All companies selling fertilizers, as well as many state agricultural colleges, refused to accept agricultural limestone in the list of fertilizers, claiming it was not a fertilizer but a "soil neutralizer," yet Prof. Chas. E. Thorne of the Ohio Agricultural College has said, "without lime there can be no life, either animal or plant." The late Dr. Cyril G. Hopkins, Chief of the Agricultural College of Illinois, said, "the only fertilizers not naturally produced on the farm itself are ground limestone and ground rock phosphate."

Dr. H. J. Wheeler, formerly with the Rhode Island Agricultural College and now with the Agricultural Service Bureau of Boston, said, "liming is the most economical basic treatment of the soil known, in fact no other basic treatment is either so economical or lasting, or is it followed by such general good results as liming." Prof. Chas. E. Thorne of Ohio again said, "every other fertilizing material, including farm manure, depends on the lime supply."

And yet in the face of the above statements from the three greatest authorities on soil building and fertilizers we have ever had, men to whom the farmers were looking for instruction, would claim limestone could not be considered a fertilizer.

Webster defines a fertilizer: Any material used as a manure for land.

Manure is defined: Any fertilizing substance used for enriching the soil.

To fertilize is defined: To make fertile, render more fruitful.

To prove then that ground limestone was actually a fertilizer it was necessary to prove that it would make soil more fruitful.

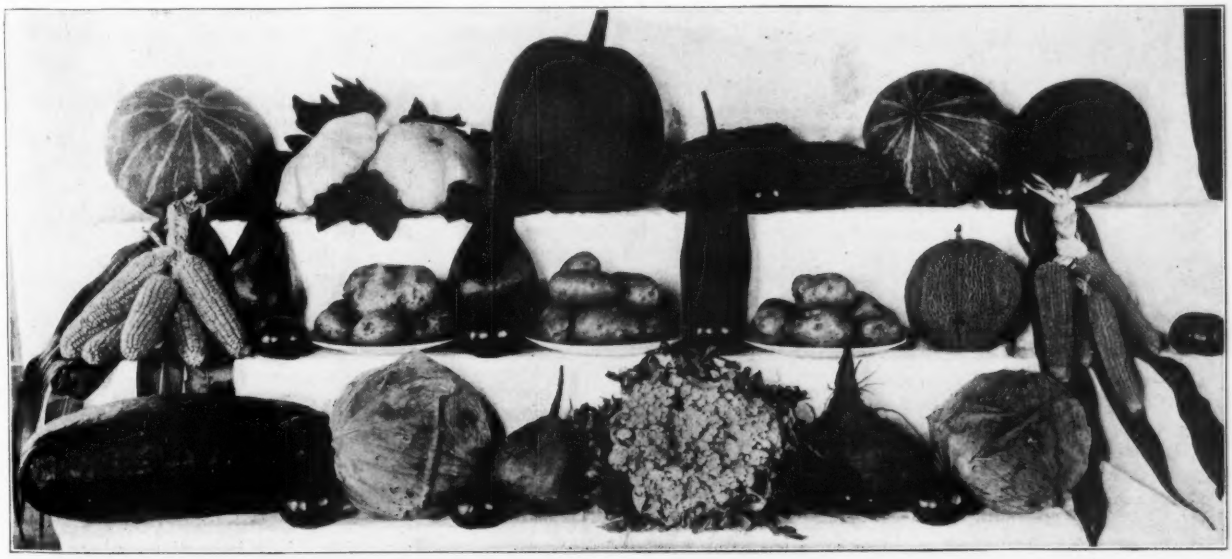
With these facts before me I decided to personally make the test.

My Own Tests

I secured a tract of land that had received no soil treatment of any kind for twenty-five years, and had become depleted almost to the point of non-production.

In the fall of 1919 I limed the soil with a heavy application of ground limestone and let it lay over winter on fall plowing. In the spring of 1920 I personally prepared the seed beds and planted on the 17th, 18th and 19th day of May.

On October 21st I made a display of a variety of the crops in my garage, which



"The proof of the pudding is in the eating." The proof of the value of limestone is the garden product

I photographed, and which was claimed by our county agricultural agent to be the finest display and the largest variety he had ever seen in Waukesha County from one farm. A copy of the photograph is here reproduced for your judgment.

It has taken time to work out this plan of proof, but I have positively proved that Webster, Hopkins, Wheeler, and Thorne are correct and that ground limestone is just as much a fertilizer, in the fact, that it will singly and alone render land more fruitful than any other substance used as a fertilizer, and is a fertilizer beyond any question whatever.

A "Perfect" Agricultural Limestone

During the time of experimental work to prove limestone a fertilizer, many interesting facts have also been proved relative to what constitutes a "perfect" agricultural limestone, which I believe will be interesting to those following this line of work.

At the beginning I felt certain of one thing; that to be of value a stone must of necessity be soft and soluble. This was contradicted by many soil men of experience, who claimed that a soft material was unnecessary, so long as the material was finely ground.

It was very soon demonstrated that a hard rock finely ground did not give the results attained by a soft stone more coarsely ground.

After this was proved, other tests were made and the vital points studied to ascertain if possible what grinding and class of material was best for the most economy in use.

It was discovered that with a rainfall of 29 to 30 in. per annum, 2½ lbs. of calcium was leached out of the soil for every cubic foot of water passing through it and that the finer the material was ground the more subject to leaching it was.

This proved that in a section of plentiful rainfall the leaching was a heavier drain on calcium in the soil than was the cropping.

Coarse grades of limestone were tried out, only to find that the soft soluble stone would give results where the hard rock of the same grinding would not produce for three years, thus proving the soft stone was preferable and more satisfactory, being more economical to use and giving desired results.

On further investigation it was found that experiments at state agricultural stations making tests for the past forty years had decided on a material consisting of a combination of powdered material mixed with a material a little coarser, and on account of this being found most economical in use and most efficient for results, laws have been made in some states regulating the grading accordingly.

With these facts at hand, I was forced to realize that in our state, where agricultural limestone is being offered, in nearly every case the material was a waste material or a by-product; no special agricultural limestone was being offered, and that to give the farmers what they really expected and were entitled to a strictly agricultural limestone plant was necessary.

I therefore secured a quarry, recommended by W. W. Weir, recently professor of the soils department of the University of Wisconsin, as the best agricultural limestone in the state, and put into existence the Wisconsin Limestone Co., which at present is constructing a strictly agricultural limestone plant that will be run exclusively to produce a material which my tests have proved to be the most economical to use and one that will guarantee the results expected.

The agricultural limestone industry is in its infancy. It must come into its own, for without it agricultural production will continue to be less and less each year.

We should be positive about one thing in the manufacture of agricultural limestone: that the farmer receives that which is best and most economical for his use, for one failure in a district kills the use of the material for a long period of time and is not only a loss to the manufacturer, but to the farmers as well.

I will be pleased if the proved results assist anyone in the work and encourage the manufacturer who has the right kind of material to put his product in the correct combination for a perfect result. I will be pleased to assist anyone by further information on the tests I have made.

Our soils bureau is maintained for the purpose of giving free instructions and information relative to soil building and general farming.

Secretary of Agriculture Urges Operation of Muscle Shoals Nitrate Plant

IN HIS ANNUAL REPORT the Secretary of Agriculture renews his request for funds to operate the Muscle Shoals air nitrate plant in A'abama. The United States Government has already sunk millions in this enterprise and some people are anxious to sink millions more to permit the Federal authorities to compete with legitimate business. He says:

"The completion, shortly before the armistice, of the nitrogen fixation plant at Muscle Shoals, Ala., offered a hope for an independent source of nitrogen for fertilizer use in time of peace. This plant is prepared to make calcium cyanamid or, by some additions, to manufacture ammonium sulphate. With modifications, also, it may be equipped for the preparation of highly concentrated fertilizer materials which will be free from filler and therefore result in a considerable saving in freight charges. The plant is still idle, awaiting the necessary authority from Congress for its operation. It is hoped that the matter will receive consideration at the next session of Congress and that the requisite authorization will be granted without further delay, in order that the nation may escape once for all from its dependence upon foreign nitrate fields, and that an adequate supply of nitrogen may be developed, both as a protection in times of national stress and to meet the growing demand for this valuable product for fertilizer purposes.

Potash Recovery

"Two processes for the recovery of potash from certain rocks have recently been developed by the Bureau of Soils, and both are being utilized in commercial practice. The 87,000 tons of potash annually lost from flues and stacks of cement plants are still, in the main, going to waste. Only about one per cent was recovered in 1919. A similar situation exists with reference to the collection of potash from blast furnaces. The department is now making a survey of this situation and preliminary results show that the dust from blast furnaces is higher in potash content than the cement dust and that it can probably be recovered more economically.

"The potash that escapes from these two sources would, if collected in marketable form, go a long way toward meeting the normal potash requirements of the country. There is ample justification, therefore, for the appropriation of sufficient funds adequately to study those phases of the problem which properly come within the scope of this department's activities."

Texas Potash Awaits Development

ACCORDING to the reports of chemists who have tested the water and earth material of the briny lakes of the South Plains region of Texas, they contain potash in great abundance. One basin, which covers nearly 6,000 acres, has a potash content of 12 per cent. Practically all the briny lakes of the district have been under lease for potash development for more than a year, but nothing has been done toward development, largely through fear of large importations of German potash, which might make operation of domestic deposits unprofitable. Tentative plans call for piping the potash-laden water to railroad points where large plants are to be built for the separation of the potash.

Epoch-Making Rate Case

Pennsylvania Sand and Gravel Producers Ask Revision of Rates and Offer Constructive Suggestions for a Rate Basis That Will Yield the Railways the Revenue They Want

ALTHOUGH the Interstate Commerce Commission has recently overruled the Indiana and Illinois Public Service Commissions and ordered all railway rates in these states increased to the interstate level, it is not likely that *all* rate cases argued before the various state commissions are entirely lost effort. The Supreme Court of the United States has yet to pass on the constitutionality of the Esch-Cummins Transportation Act. But better still the railways themselves are beginning to be influenced by the validity of the arguments of some of their shippers.

It is quite probable that the Supreme Court will uphold the orders of the Interstate Commerce Commission, in which case the various state cases *will* have been in vain if they have not served the purpose of opening the eyes of the railway managers themselves to the fairness of the contentions of their shippers in those cases. That is why the Pennsylvania case, described in what follows, varies from most other cases. For here the shippers have shown as much knowledge of the railway's business as the managers of the railways themselves possess. Moreover, the sand and gravel men have not asked for special concessions, for lower rates primarily because someone else's rates were lower than theirs, nor because they were so poverty stricken they have to have low rates or go bankrupt. They have based their case, and apparently proved it, on the basis that the scale of rates they suggest will actually prove more remunerative to the railways than the present scale of rates.

Some Details of the Case

The original complaint was filed August 12, 1920, by the Pennsylvania Sand and Gravel Producers' Association and by nine of its individual members. The principal railways of Western Pennsylvania, about 20 in number, are named as defendants. The hearings were held before the Pennsylvania Public Service Commission, at Pittsburgh, October 29, 1920, to January 27, 1921. The principal witnesses for the sand and gravel men were Alex. W. Dann, of the Keystone Sand and Supply Co., Pittsburgh; Joseph C. McClain, of the McClain Sand Co., Pittsburgh; and E. Brooker, traffic manager of the Pennsylvania Sand and Gravel Producers' Association. To Messrs. Dann and Brooker belongs much of the credit for assembling and presenting the data in the case. The attorneys for the sand and gravel men were Borders, Walter, Burchmore & Collin, of Chicago and Pittsburgh, who are among the best-traffic lawyers in this country.

The general contention includes the usual statements in regard to rates on sand and gravel being out of proportion to the rates on other commodities and out of line with rates on the same commodities in other territories. In this particular case, undue discrimination in favor of crushed stone and crushed slag is also contended.

Sand and Gravel Should Have Low Rates

The usual arguments, that because of the nature of the commodities, sand and gravel should have the lowest rate scale of any commodities moved by the railways, ends with the following summary:

"Whether the rates be judged from the standpoint of cost of service, the value of the service to the shipper, on the *ad valorem* theory or on any other theory, charging all that the traffic will bear—any way it is put—sand and gravel stand at the foot of the list."

Attention is called to the fact that the tariff schedules of the various railroads do not contain a consistent adjustment of sand and gravel rates. The exhibits presented by the sand and gravel men show a wide variance in the amount charged by each railroad for hauls of a given distance between various points on its own lines. Moreover, there is a wide variation between the amounts charged by one railroad for particular movements of a given distance and the amounts charged by other railroads for the same length haul.

It was shown that prior to the 40 per cent advance on August 26, 1920, the rates for a five-mile haul varied all the way from 40 to 70 cents; for a 10-mile haul from 60 to 80 cents; for a 15-mile haul, 60 to 90 cents; and so on up to a 100-mile haul, where the rates varied from $1.10 to $1.80 per ton.

Distance Alone Not Controlling Factor in Rate-Making

In connection with the presentation of this exhibit the sand and gravel men recognize specifically that: "Distance is not the sole controlling factor in adjusting rates on sand and gravel or other heavy commodities; but, it is an exceedingly important factor."

In lieu of the inconsistent adjustment of rates now prevailing the sand and gravel men, through Mr. Brooker, their traffic manager, have suggested a general basis of rates, which they are now asking the Pennsylvania Commission to apply at once as a maximum scale. They add that in applying this scale as a maximum they have in mind that within reasonable limitations a longer haul may be shaded from the full measure of the scale to meet the competition of a shorter line between the same points or to meet the competition of another producer a shorter distance away on another line. It is expected, however, that this would be done only to a reasonable extent and in an intelligent way.

The sand and gravel men assert with confidence that the effect of the proposed scale would not be seriously detrimental to the fair interests of the railroads, but on the contrary, would result in an increased production and shipment of their commodities and the centralizing of tonnage at producing points, thus affording the railways longer hauls, opening up additional markets to the shippers to the advantage of the public and not less to the advantage of the railroads themselves.

Proposed Scale of Rates

In arriving at a scale of rates to apply on sand and gravel, as well as on other commodities, the sand and gravel producers in their argument recognize fair and reasonable charges for: (1) *Terminal service,* involving the service performed at origin point and destination, in placing and removing empty cars and removing load to adjacent yards or main-line tracks, and delivering to industries. (2) *Road haul movement,* exclusive of terminal services at origin point and destination.

The sand and gravel men did not attempt to construct the proposed rates on a basis of what these services cost the railways. They used the published charges of the railways themselves for terminal service of the same character as that involved in the movement of sand and gravel. For example, the Union Railroad in the Pittsburgh district has a specific charge of 17.5 cents per ton for placing an empty car at an industrial plant for loading and for handling the

loaded car from such a plant to its yard and thence to its connection with another railroad. Likewise, it charges 17.5 cents per ton for accepting a load from its connection with other railways, handling the loaded car to the plant and returning the empty to its own yard.

The legitimate charges for terminal services on sand and gravel are obviously about the same, so that the sand and gravel producers in their argument adopted the sum of these two terminal charges, or 35 cents per ton, as the basis of their scale of rates. This is claimed to be a *liberal* allowance in the case of these commodities because in reality there is less terminal service in connection with a road haul movement of sand and gravel than when, as in the case cited, the car is delivered to a connecting line. For example, this same Union Railroad charges only 28 cents per ton for (a) handling the empty car from its yard to an industry; (b) handling the loaded car from the industry to the yard; (c) classifying and weighing; (d) handling the loaded car from yard to another industry on its own lines; (e) returning the empty car to its yard. Such hauls amount to as much as 15 miles.

It was further pointed out by Mr. Brooker that this terminal charge is for movement in a congested district, where values are higher, interest on investments and taxes correspondingly more than at many origin points and destinations of sand and gravel.

For the second part of the proposed scale the sand and gravel men ask a mileage rate of six mills per ton-mile. This rate is based on the general argument that sand and gravel are low-grade, low-priced commodities, with average carloadings exceeding the loadings of any other commodity; that the cheapest class of equipment is used for loading; that there is no risk from loss of the commodity in transit; that when the production is not restricted by excessive rates the commodity moves in such large volume from each plant as to insure the railroads a profitable business.

The scale compounded of these two elements would then be as follows:

Mileage Groups	Suggested Rate per Net Ton	Mileage Groups	Suggested Rate per Net Ton
5	.40	80	.85
10	.40	85	.85
15	.45	90	.90
20	.45	95	.90
25	.50	100	.95
30	.55	110	1.00
35	.55	120	1.05
40	.60	130	1.15
45	.60	140	1.20
50	.65	150	1.25
55	.70	160	1.30
60	.70	170	1.35
65	.75	180	1.45
70	.75	190	1.50
75	.80	200	1.55

There is no objection on the part of the sand and gravel men to widening the proposed blocks to distances of 20 or 25 miles. This would place the producers within a certain district more on a parity with each other, and, it is said, if the basis of rates proposed is deemed reasonable for 25-mile groupings, these would be preferable to the sand and gravel producers.

Earnings of the Railways Based on Proposed Scale

Mr. Brooker made and presented as an exhibit a table of the earnings the railways would make under the proposed scale as compared with their average earnings on all their traffic for the year 1919. This tabulation showed that the suggested rates, when applied to an average loading of 50 tons per car on sand and gravel, which is lower than the actual average, produce revenue per car much greater than the average received by the different railroads for the year 1919, *for equal mileages*. The average earnings per car-mile and per ton-mile also compare very favorably under the suggested scale with the average shown on all freight during the year 1919.

Based on the foregoing comparisons, the sand and gravel men contend that the suggested scale applied on sand and gravel would be fair and reasonable to the railroads, taking into consideration the average earnings shown for the year 1919, *even with 40 per cent added to such average earnings*. It is also claimed to be "a fair scale considering the transportation conditions which surround the handling of these commodities by the railroads; and it will produce freight rates more in line with the low market value of the commodities and enable the producers to reach a wider range of markets, thus encouraging instead of stifling the sand and gravel industry."

Outline of Argument Presented

1. The rates maintained and charges exacted on carload shipments of sand and gravel between points in Western Pennsylvania are unjust and unreasonable.

(a) *No evidence offered by the railways except the P. & L. E. and Pennsylvania Lines.*

(b) *Favorable transportation characteristics of sand and gravel.*

(c) *Present schedules inconsistent and revision needed.*

(d) *Unwarranted increases in sand and gravel rates recently.*

(e) *Federal and state commissions did not pass on advances for individual commodities.*

(f) *Rates unreasonable compared with rates on other commodities.*

(g) *Railways' cost testimony, while showing inflated costs, supports demand for reduction.*

(h) *Rates unreasonable compared with similar rates elsewhere.* L

2. Rates are unduly prejudicial, subjecting sand and gravel producers to undue disadvantage, as compared with producers of crushed slag and crushed stone.

(a) *Railroads' contention that slag rates were originally published to induce movement.*

(b) *Present slag rates unreasonable and should be reduced, not advanced.*

3. Public interest requires the maintenance of reasonable rates on construction materials. While reductions in rates are sought, the revenues of the railroads will not be reduced correspondingly; and the revision of these rates is in the best interests of the railroads.

(a) *Importance of sand and gravel industry and magnitude of investment therein.*

4. Burden of proof is on the railroads to justify present rates, which burden they have failed to bear.

5. Scale suggested by sand and gravel men will produce consistent, fair and reasonable rates and will afford railroads ample compensation for services rendered.

Michigan Sand and Gravel Rates Way Up

MENTION has already been made in recent issues of Rock Products of the case the State of Michigan is making for a reduction in sand and gravel freight rates. Figures have been prepared by George J. Bolender, manager of the traffic bureau of the Kalamazoo Chamber of Commerce for presentation soon to the Michigan Public Utilities Commission on behalf of county highway officials of the entire state which show that while the average freight rate boosts for Indiana have been only 95 per cent and for Illinois 102 per cent, those for Michigan have been 149 per cent, instead of 139 per cent, as previously announced. That the increase in this state is more than 50 per cent greater than it has been in Indiana and nearly 50 per cent greater than in Illinois is ample evidence, shippers maintain, that they have been discriminated against.

New York Rate Case

THE CASE of freight rates on sand, gravel, crushed stone and slag in New York State is still pending. A hearing was given the producers on Feb. 16, and Feb. 26 the railways were given an opportunity to cross examine the witnesses. It will then remain for the commission to decide whether the 40 per cent increase will go into effect, or whether it shall be something less than 40 per cent.

President of the Santa Fe Railway on Rates

In Letter to Rock Products Sees Trend Toward More Scientfic Basis of Rates on Crushed Stone, Sand, Gravel and Slag

THE SANTA FE is interested in the welfare of every class of shippers served by its lines. Their success is in a very large measure our success, and we have long since learned that a contented people in the territory tributary to our lines is our greatest asset. In other words, every effort consistent with the "honest, efficient and economical" management required by the Transportation Act is put forth to assist our patrons in marketing their products.

Only the most general statements are possible with respect to the points which you raise. The trend is unquestionably toward a more scientific method of making freight rates in which all elements of costs, some heretofore but lightly appreciated, must be given consideration. The Interstate Commerce Commission, for instance, has in many recent cases indicated a desire to segregate the terminal and road-haul costs which carried to its ultimate conclusion would mean a mileage system of rates built upon the two factors I have just mentioned as bases. This, because of the fact terminal costs have increased in a much greater ratio than have road-haul costs, and because the terminal costs of handling a carload of sand, gravel or crushed stone do not differ greatly from those incurred in the movement of a much higher rated commodity, will unquestionably demand a higher level of minimum freight rates upon these low-grade commodities than did obtain in pre-war days.

On the other hand, the "value of the service" will, I believe, always be an important factor in the making of freight rates and I cannot conceive of the adoption of a rigid, inflexible system of mileage rates upon such commodities as sand, gravel, crushed stone, etc., which shall give no consideration to the conditions under which the traffic is moved. There is no general move upon the part of the carriers of which I am aware to make effective a strictly mileage basis and I should say it would be difficult to do this because of the varying conditions in the different localities.

As time goes on there is not unlikely to be some modification in the longer distance rates upon these lower-grade building materials but I cannot see in the future any condition likely to arise which will justify a reduction in the present minimum rates. The movement of these commodities is very large and the railroads could not justify handling them without proper compensation, since to do so would place an undue and unjust burden upon some other traffic. The traffic departments of the carriers, however, are aware of the conditions and necessities with respect to these commodities, realize that the handling and transportation costs form the largest elements in their values, and that to make them available they must be moved in most cases at rates the level of which is but slightly above the actual cost of handling.

(Signed) W. B. STOREY,
President, Atchison, Topeka and Santa Fe Ry.

Chicago, Ill.,
January 21, 1921.

Railways Themselves Want to Reduce Rates

"THE RAILROAD COMPANIES are now receiving, and shippers and travelers are now paying, the highest rates in the history of the country. Yet the railroads are not within striking distance of an adequate earning power, nor are these high rates affording the basis for an expansion of facilities and service for the benefit of the users of transportation. In other words, even the present high rates are not sufficient to assure an adequate earning power to the railroads and at the same time to carry the burden of the scale of operating expenses inherited from the war and from the period of Federal control.

Railroads Hope to Be Able to Reduce Rates

"The railway executives do not propose to suggest another general increase in rates. On the contrary, they desire as rapidly as possible to reduce operating expenses to a point which will not only insure an adequate earning power to the railroads, but will make possible an ultimate reduction in rates.

"The entire country, its consumers, its farmers, its workmen, and even the railway employes themselves, are directly interested with the railroads in cutting down railway operating expenses.

"Only through an adequate earning power can the railroads again proceed to develop and improve their facilities to meet the growing needs of the country.

"Only through an ultimate reduction in transportation costs can the flow of commodities be increased and the sources of production and distribution of goods be enlarged."—Statement of Thomas DeWitt Cuyler, chairman of the Association of Railway Executives to United States Railway Labor Board.

Idaho Phosphate Industry at a Standstill

THE DEVELOPMENT of the phosphate industry of Bear Lake County, Idaho, is somewhat at a standstill, said to be due to slack market conditions at coast points, where the greater part of Bear Lake phosphate rock has been shipped during the past year or two.

The American Phosphate Corp. closed down its mines Dec. 31, and hauling, which is done by means of trucks, was suspended some time. Most of the men employed in the mines in Montpelier Canyon are therefore laid off. Just how long the mines will be inactive is not known, and officers of the company decline to comment on the situation. However, they are maintaining a spirit of optimism, and orders to continue shipments to San Francisco are expected.

On the west side of the valley one of the big producing companies has closed its mine. The Bear Lake Phosphate Co., however, has just reorganized, the partnership heretofore existing being changed to a corporation, and this company is active in mining and shipping crude and milled phosphate rock.

The Spring Market for Fertilizers

THERE HAS BEEN CONSIDERABLE TALK about a reduced tonnage of fertilizers for spring planting. The causes which are expected to bring about this condition of the market are the present surplus of farm products, and the resulting low prices, together with the unwillingness of farmers to buy fertilizers unless the price is reduced proportionately to the price of farm products. Financial conditions in the Southeastern States growing out of the holding of cotton and tobacco, have also been expected to restrict the use of fertilizers on the 1921 crops.

As a matter of fact actual investigations in all the fertilizer-using States indicate that conditions in the industry are not half as bad as some people think. Indeed a spirit of optimism has been found throughout the industry at the present time. Fertilizer salesmen who have been out working for the spring trade have been agreeably surprised at their reception. Many of them went out with faint hearts, but found the farmers willing and ready to buy.

At least half of the farmers own the land they work, and much more than half the fertilizers are used on this land. These men know by experience the value of fertilizers. They also know that a period of low prices is inevitably followed by a period of rising prices. These farmers have been using fertilizers on more crops, have been buying labor-saving machinery, and have been bettering their methods of farming generally. These men are now buying fertilizers, and will use as much or more than usual.—"American Fertilizer."

Promoting Mineral Fertilizers

National Organization Planned to Investigate and Promote Lime, Limestone, Rock Phosphate, Gypsum and Potash Rocks

AN APPEAL is being made to producers of lime, agricultural limestone, ground rock phosphate, gypsum, potash shales and other rock fertilizers, as well as manufacturers of machinery or equipment used in their production or application, to join the Association of Natural Soil Fertility Resources, the office of which is at 111 West Washington Street, Chicago, Ill. To get the idea started H. H. Macdonald, of the Gypsum Industries Association, is acting as temporary secretary.

The prospectus of the association states:

An economical and permanent fertility system can be developed based on the use of the natural mineral fertilizers. Between them they supply calcium, sulphur, phosphate and potash; add nitrogen to the soil by increasing the growth of legumes; neutralize soil acidity; conserve the plant foods in manure; render available plant foods which already exist in the soil and in each other.

Attention is all these materials need to increase their use by the farmers of this country many fold. They need to be pushed and they need to be studied. Above all, they need to be made easy for the farmer to use. The needs of soils in many sections of the country can be cared for by proper combinations of the mineral fertilizers. But the average farmer can not and will not work these combinations out for himself—it is the business of those who want to sell to him to do this for him—to give him "service."

To give this service, to promote the sale of the mineral fertilizers, to study their use in co-operation with the agricultural experiment stations of the country, to determine and enlarge the regions in which they can be economically supplied—these are, mainly, the objects of the *Association of Natural Soil Fertility Resources.*

Plan of Organization

A. Vere Martin, vice-president of the Lake State Bank, Chicago, as treasurer and chairman of the finance committee of the association has issued the following circular letter:

Need for Concerted Effort

Dr. William Crocker, Professor of Plant Physiology of the University of Chicago, who is giving his services as agricultural adviser for the Association of Natural Soil Fertility Resources, has pointed out to us that while approximately five million tons of lime and limestone are now used annually there is a positive need of very many times that amount on the sour soils of the country. It is hardly necessary to emphasize the value of an association in furthering a big movement such as that presented, to sell the farmers throughout the land on the merits of mineral fertilizers, and to offer, in promoting the sale of our products, a complete system of soil fertility. We therefore feel that the mineral fertilizer group have a wonderful field and opportunity before them. Through concerted action we can put our message across in a very effective way and actually produce a further market for your material.

Beginning Made

You have on file the report of the preliminary meeting of the association held in Chicago, September 8, 1920. Since then, the staff has been active in a campaign which has included correspondence with agricultural colleges and experiment stations and the distribution of several thousand copies of the report of the meeting. Without exception acknowledgments of the report have been commendatory and leading agricultural scientists have declared that if we continue in the careful and accurate way in which we have begun not only will our association be a great success but the good we shall do for agriculture will be very considerable. Some of them have definitely welcomed the idea of association fellowships and we shall have no difficulty at all in securing their help in the experimental work we are to carry on.

Your Support

We are now at the point where we should tell our story to the farmer and hammer home to him the value of the mineral fertilizer program. At a recent meeting of the finance committee, and with the approval of the executive committee, charter memberships have been fixed at $50 for the producers of mineral fertilizers. Manufacturers of machinery and equipment used in producing the mineral fertilizers and the agricultural departments of railroads will also be asked to take out charter memberships, the railroads in the sum of $500.

Use of Funds

The money raised from the charter membership fees will be used in the publication of literature and as far as possible in national advertising. We shall also be making arrangements for a national meeting of the mineral fertilizer group to be held in Chicago as soon as our publicity plans are fairly well under way. The farm papers have already given us favorable comment and this is the kind of publicity we shall push as soon as funds are available for postage and printing.

Two Lawsuits Over Gypsum Wall-Board Patents

Actions Begun in California and in New York State

ADVICES from Los Angeles, Calif., state that a lawsuit has been started in the United States District Court which involves five patents on what is known as wall and plaster boards, which have been revolutionized house construction in Southern California and elsewhere. The plaintiff in the action is the John Schumacher Wall Board Company, Fifty-eighth and San Pedro streets. The defendant is the Buttonlath Manufacturing Company, with shops at 2800 Vernon avenue, Los Angeles.

Depositions and testimony have been taken in Buffalo, Chicago, New York, Seattle and a number of other places. It is estimated that the cost of the litigation so far has been more than $50,000.

The patents involved cover a manufactured article that has been largely used as a substitute for lumber in Southern California building construction. The industry is one of the big ones of Los Angeles.

The plant of the Schumacher Company was destroyed by fire some time ago, but business has been resumed in temporary structures.

Raymond Ives Blakeslee and J. F. Westall represent the plaintiff, and John R. Mott, Robert M. Cross and George B. Wilson the defendant. A number of the best known business men of this city are interested in both companies.

New York State Case

Alleging that the Niagara Wall Board Co., of Penn Yan, is infringing upon their patents and trade secrets, the Beaver Board Companies of Buffalo, N. Y., have brought an action for an injunction against the Penn Yan company in the Supreme Court. This action is regarded as an answer or counter suit, to a suit over a contract for raw material, commenced in January, 1920, by the Niagara Ball Board Co. in the Federal District Court against the Tonawanda Board and Paper Co., which is controlled by the Beaver Board Companies.

In the suit against the Tonawanda company the Penn Yan company alleged that the former had ceased to fulfill the terms of a contract entered into several years ago, before control of the Tonawanda company was acquired by the Beaver Board Companies. The contract, it is said, called for the Tonawanda company to furnish raw material to the Niagara company.

The Beaver Board Companies in their action for an injunction are said to charge than the Penn Yan company was originated by two of their former employees, John O'Brien and Cecil C. Hollinger, who have made unlawful use of the patents and trade secrets of the plaintiff. The attorneys for the defendant company, Locke, Babcock, Hollister & Spratt, say that the Beaver Board Companies have no patents or trade secrets.

Mr. O'Brien is the president and Mr. Hollinger the secretary and treasurer of the Niagara Wall Board Co. The suit of the Niagara company against the Tonawanda company is scheduled for trial in Federal District Court in Buffalo in March.

Editorial Comment

Illinois Road Prices

Bids opened at Springfield, Ill., for 125 miles of state concrete road to be built this season showed an average of $31,535 for the low bids. This then is the average estimated minimum price of a mile of concrete road 7 in. thick and 18 ft. wide. This price is about down to the level of the 1919 price for a similar pavement. But since freight rates on all materials entering into the construction of these roads have been increased 35 to 40 per cent, it follows that the prices of the materials themselves are actually that much cheaper than they were in 1919. The estimated average increase in freight charges on the materials for a mile of road are conservatively placed at $3000 to $4000. Hence materials are really about 10 to 20 per cent lower than in 1919.

There was keen competition for the work. There were 427 bids by 190 bidders for the 125 miles. Hence, all things considered, there is reason to believe that this price is about as low as will be reached this year. There is a tendency on the part of rural communities to compare this reduction of 10 to 20 per cent in the price of labor and materials with the much greater shrinkage in the price of corn and other agricultural produce at the farm. However, all signs point to a return of roadbuilding activity and the farmer himself will soon realize that this is the quickest way to increase the price of his corn.

Well-Done Rate Case

A rather lengthy summary of the brief recently filed with the Pennsylvania Public Service Commission by the Pennsylvania Sand and Gravel Producers' Association is given elsewhere in these pages. Undoubtedly this is one of the best prepared cases in the history of the industry. Mr. Brooker, traffic manager of the association served for over six years (1909 to 1915) on the Uniform Basis of Rates Committee and also on the Brick and Sand Committee of the Central Freight Traffic Association railroads. (He was then chief of the traffic bureau of the Erie R. R.) He is therefore thoroughly familiar with rate structures not only on sand and gravel, but on all other traffic as well. He is thoroughly capable of understanding the railways' point of view and in drafting his proposed scale, he did in fact endeavor to present a case as acceptable to the railroads as to the shippers.

Mr. Dann, of the Keystone Sand and Supply Co., who has given for many months practically his whole heart and energy to this case, was also exceptionally well posted because he has had the experience of operating about 20 miles of railroad, which was abandoned during the war, in order to keep one of his company's operations alive. To cap the climax, the case was presented by a firm of traffic lawyers whose previous experience has peculiarly fitted them to handle cases involving sand, gravel and crushed stone.

Altogether the 120-page brief of this case is the most interesting reading of any legal document the editor has ever seen. Whether or not the Pennsylvania Public Service Commission decides for or against the sand and gravel industry undoubtedly an immense amount of good has been done in convincing the railways themselves of their past errors, and the friendly and constructive way in which this brief handles the problem of the entire sand and gravel industry and the railways, will, we believe, be an important stepping stone to a better understanding all around.

It will be noted that in this case the producers have agreed among themselves that a uniform scale is the scale they want; but they have asked for this scale only for a limited industrial district and no claim is made or inferred that this scale is the right and proper one for any other district. The lesson in this case for producers elsewhere lies in its *constructive features.* The Pennsylvania producers have not "passed the buck," they have unflinchingly shouldered their responsibility, in objecting to the present rate, of naming what in their opinion is a fair rate under the circumstances.

The railways presented only a half-hearted defense of their case, and if any fair-minded railway traffic man will take the pains to read this brief from cover to cover, he will be a better traffic man than he was before.

Combating State Competition

Why is it, that politicians and the uninformed general public from which they come think whatever comes out of the ground is cheap and easy for anyone to make? Very likely because so little has been said or written by the men actually engaged in those industries to enlighten the people outside their little clique of the real nature of their business.

A number of cement manufacturers and a few producers of other rock products take the attitude that secrecy is their best ally against competition. There never was a more exploded theory than this. The crop of prospective state-owned plants is the proof. If state officials and the general public was better informed of the really intricate nature of the manufacture of portland cement and the difficulties and pitfalls in the business of marketing it, they would not be quite so cocky about their ability to compete with commercial plants.

Publicity is the ally of the cement manufacturers and other rock products producers—taking the public into confidence. The producers who attempt to throw a veil of secrecy about their plants and their business always give the impression that their profits are in keeping with other shady enterprises.

Experiments to Develop Dolomite Refractories

Work of the Ceramic Station of the Bureau of Mines at Columbus, Ohio, in Behalf of the Ceramic Industry

LARGE QUANTITIES of magnesite are used for furnace linings in the metallurgical industries. Up until the war began, substantially all the magnesite used for the manufacture of refractories came from Austria and Greece. When Austria entered the war the exportation of magnesite from that country was shut off, and soon afterwards the exportation of the Grecian product stopped.

The American refractory manufacturers were, therefore, compelled to draw upon the American magnesite deposits, which are said to be inferior to the foreign magnesite for refractory purposes.

These deposits are situated in the States of Washington and California, whereas most of the metallurgical industries, notably steel, utilizing magnesite refractories are centered chiefly in States east of the Mississippi River. Owing to cheap labor in Austria and Greece and water transportation, the foreign magnesite in normal times can be delivered to points east of the Mississippi River cheaper than the magnesite from the Pacific Coast. During the war, the selling price of magnesite brick quadrupled in value.

Dolomite, the double carbonate of lime and magnesia, is widely distributed throughout the United States and occurs in large masses. The State of Ohio contains thousands of acres of dolomite with very little or no overburden. Its principal use is for crushed rock in surfacing roads and in concrete work. It also finds a limited use in the manufacture of "dolomitic lime."

Before dolomite can be successfully used as a refractory for furnace linings, it must be calcined at a high temperature in order to remove its shrinkage and to place it in a "stable" or "dead-burned" condition. The lime content is the troublesome ingredient, it may cause the calcined dolomite to "slake" or "disintegrate" when stored in the open air.

In order to prevent slaking of the calcined product, there must be added to the dolomite a suitable material which will combine with the lime and place it in a condition in which it will not disintegrate. The substance added to the dolomite to bring about a dead-burned condition is called a "dead-burning agent." It must be of such a nature that it will not lower the melting point of the dolomite so low as to render the latter useless as a refractory, and the dead-burning agent must also be inexpensive.

Several patents have been granted on methods of dead-burning dolomite for refractory purposes, and three or four firms have placed the product on the market under different trade names. It is sold in lump or granular form, and is mixed with slag and tar and tamped in the bottoms of furnaces. It is also used for temporary patches for furnace walls.

Magnesite brick will stand storage indefinitely without disintegration, but up to the present time, a firebrick made from dolomite which can be stored indefinitely without crumbling has never been produced.

The different patented processes of preparing dolomite for refractory purposes were investigated by the ceramic experiment station. It was found that all such products would show signs of disintegration within one week to six months.

Other methods of dead-burning dolomite were devised and tried by the ceramic station. The briquets made from the different calcined dolomites are stored in the open air and observed every week. Two of the samples prepared from calcined dolomite have been under observation for for more than a year. They still appear to be sound and show no signs of disintegration. Further tests on these promising dead-burned dolomites are to be made, and if it can be demonstrated that firebrick can be made from dolomite which will compare to magnesite firebrick and will stand storage indefinitely without crumbling, it will be the means of developing a new industry of far-reaching importance.

The ceramic station proposes to investigate the refractory resources, State by State. A co-operative agreement has been made between the United States Bureau of Mines and the Geological Survey of Ohio for investigating the fire clays of that State.—U. S. Bureau of Mines, Reports of Investigations.

State Cement Plant Idea Spreading in the West

South Dakota Has Passed Bond Issue of $2,000,000 to Acquire Cement Plant—Missouri, Kansas and Montana Contemplating Building Plants

NEWSPAPER DISPATCHES and notes from our correspondents during the last two weeks bring out the fact that the State Legislature of South Dakota has voted a bond issue of $2,000,000 to acquire and operate the new Portland cement plant nearing completion at Rapid City. This fact is being made of great use by the politicians of Missouri, Kansas and Montana, to induce their legislatures to start building cement plants.

As an example, we quote the following from a local newspaper in Missouri:

Cement Sold at $2 a Barrel at Profit

Jefferson City, Mo.— South Dakota soon will be selling cement profitably at $2 a barrel and paying the freight on the product to any part of the state, according to Paul E. Bellamy, of Pierre, S. D., a member of that state's cement commission, who is in Jefferson City to appear before the committee investigating the feasibility of establishing a state-owned plant in Missouri.

The state passed a $2,000,000 bond issue to erect its own cement plant, which now is nearing completion at Rapid City, S. D. The cement can be produced at about $1.30 a barrel and sold profitably at $2, freight paid within the borders of the state. The State Highway Commission is expected to use half of the plant's capacity of 2,000 barrels a day, and the remainder will be sold to whoever wants it, Mr. Bellamy said.

From Helena, Mont., comes word that the "appointment of a commission to investigate the feasibility and advisability of the erection of a state-owned cement plant and report back to the next assembly was contained in a bill introduced recently by Senator F. A. Long, of Lincoln County. He stated that South Dakota, Texas and California have erected plants which will soon be in operation, and in South Dakota, the commission asserted the saving to taxpayers would be $3,000,000 a year."

Again, from Topeka, Kan., we have an editorial from a local paper, which reads:

While we in Kansas quarrel over the proposal to establish a state cement plant, South Dakota has one actually in operation. The Sioux City Tribune says that it is the hope of South Dakota officials not only to supply their own highway commissioners and roadbuilders cement for their needs, but also to sell to neighboring states cement from the state plant at a reasonable price. Kansas legislators eager to do something constructive might get busy.

In other words, the woods are full of misinformed politicians and promoters who would waste millions of the public's money in wasteful and useless competition with an efficiently and economically conducted industry. What step cement manufacturers, individually or collectively, are making to combat this spread of ignorance about their business is not known, but it is evident they have not and are not taking advantage of their best ally—the press.

House-Building Will Absorb Most 1921 Production

Prices of Rock Product Building Materials Thought to Have Reached Bottom in Eastern Market

HABITATION building construction is becoming dominant in the budding spring market according to the flow of building materials and new work coming onto architects' boards, says the Dow Service Daily Building Reports.

The late business depression and industrial reaction, the inactivity of railroads as prospective spring purchasers of replenishment material and the postponement of large commercial building enterprises pending the absorption of business space that will be thrown upon the market this spring and next autumn, are factors forcing building material manufacturers and distributors to a revision of production and sales schedules at this time.

Briefly, the difference is that in other pre-spring inventory periods, the trend has been toward big-order business. Building material interests are this year concentrating upon comparatively small-order trade, but in large volume, as far as the first half of the year is concerned.

In urban districts, this trend is symbolized by a noticeable drift toward habitation building construction, such as hotels, apartment houses, tenements, store and dwelling enterprises, and the several-year deferred institutional buildings, such as hospitals, Young Men's and Young Women's Christian Associations buildings, nurseries, clubs, etc., or such structures as can be financed by Liberty Bonds and other securities without recourse to financial channels heretofore depended upon to launch the spring building movements.

In the suburban districts, this tendency is taking the form of a concentrated catering to the individual home builder, both on price and on delivery schedules. To facilitate the latter dealers are coming into the market for yard stocks while the mills are still solicitous for prompt delivery orders. Nearly all interests, therefore, have been making prices attractive, until today the first dependable sign of shrinkage limits are discerned in a widening margin between the price of low-grade and high-grade building materials.

Various symbols in the building material market show that the change that has been felt in the building industry since February 1 has the elements of progressive development.

Current reports in the cement department of the building material market indicate that one company is contracting for cement to run throughout the year, another company is asking 10 cents a barrel more for deliveries extending beyond April 1, while other companies are asking five cents a barrel more, which is giving rise in the market to the impression that in view of the low supply on hand present price levels may not be long sustained.

Glass is beginning to show some signs of improvement. This department has been upset by the influx of foreign glass. American manufacturing conditions have not changed. Labor costs are just as high. Cost of raw material has only been slightly reduced. As labor costs run more than 60 per cent of the cost of finished product, manufacturers give little hope for further curtailment in window glass prices unless a price war is forced upon them by the increasing flow of foreign glass.

Gravel, grit, sand, crushed stone and all concrete ingredients have held rigidly on price practically all winter, but the market is expecting a spring reaction reflecting the lowering cost of fuel. Many of the sources of supply are drawing upon stocks laid up when manufacturing costs were much higher and when spring production is resumed lower prices may be looked for.

Labor is sharing the conciliatory policy of materials. Iron workers have gone back to work at rates lower than they asked for. In Newark, the demand for higher wages were finally waived. Local rock men, drill runners and tool sharpeners have expressed a willingness, according to the Contractors' Protective Association, to work for $4.80 instead of $6 per day for unskilled labor, $6.25 instead of $7 for rockmen and $7.50 instead of $8 for drill runners, blacksmiths and tool sharpeners in the trade. These rates will continue for the remainder of the year unless conditions warrant re-establishment of the old rates.

Lime — Although only ¾ to 1½ per cent of the cost of the entire average building is represented by lime, this commodity is getting ready for a big buying movement. The only question is where the market will develop. Paper, leather, agriculture and other industries have become such large users of lime that it is a question as to whether there will not be a return of upset delivery schedules for those who do not get their orders in early this year. Lime companies are taking business as liberally as offered from whatever section it comes from and most of the inquiry is coming from sections outside of New York metropolitan districts. New England, for instance, may soon have the lion's share of New York district lime output for the first half of the year if the proportion of incoming orders keeps up.

Plaster has shrunk to bottom levels. The next move probably will be upward.

It is not at all probable that building material prices will be advanced this year beyond the 1920 level. All factors in the market give this assurance with hardly an exception. But they also say that prices will not drop below the 1919 spring level. For the first half, prices will skirt the 1919 range, but as the year passes its half-year turn there will be outreaching toward the 1920 price bases.

Future of the Domestic Potash Industry

WHILE THE RETURN of Alsace to France relegated Germany with her Stassfurt deposits to a secondary place as the cheapest and most abundant source of potash salts, it nowise has reduced the influence of foreign competition upon the development of a permanent potash industry.

Cost of production is the determining factor in the stability of the domestic industry. While available sources of domestic supply may be considered ample to supply American needs, their development depends entirely upon a foreign industry whose ability to lay down at our ports potash at a price that spells discouragement and defeat to American enterprise never has been questioned. Economic conditions in the Alsatian and Stassfurt fields at the present time as regards rehabilitation, development, fuel, labor, etc., together with probable limitation of production for the maintenance of prices, favor a respite to the domestic industry from foreign interference.

Importations of 39,619 short tons of potash (K_2O) in 1919 were increased during 1920 statistics of which, however, are not as yet available; which amounts added to domestic production leaves a considerable margin between present supplies and the pre-war consumption of about 250,000 tons of (K_2O). In this support of firm prices and the general opinion that importations of pre-war proportions will be deferred for an indefinite period lie the encouragement to domestic potash producers to persist in the development of the industry.—"Chemical Age."

General Market News

Conditions in Lehigh Valley Cement District

THE PAST FORTNIGHT has brought about materially improved conditions in industrial lines in the Lehigh Valley district of Pennsylvania, and increasing activity distinctly is evidenced with regard to cement production. A brightening aspect in the situation was prophesied in the last issue of ROCK PRODUCTS, and it is likely that with the turn of March things will be on a close to normal basis in this section.

A number of mills are making ready for early resumption of manufacture, not so much to cover orders in hand as to prepare for the immediate future, as the volume of business to come indicates increasing strength as the spring season approaches. Stocks are low at practically every plant, for with former prevailing high wages, there has been little inclination on the part of producers to lay by reserves that, when sold, would be on a basis of below cost.

The price of cement in the different important eastern districts is now finding a level that seems destined to hold throughout the coming spring season, at least with labor, freight rates and producing costs at present status, it is certain that the material cannot go much lower and show a reasonable profit. At New York, material dealers are selling cement at $4.10 a barrel, delivered, with rebate of $1 for bags; this is a decline of 40 cents a barrel from the figure quoted in the last issue of ROCK PRODUCTS. Quotations at Boston, Mass., hold at $5.00 a barrel, or less bag rebate, $4.00 in paper, the material is selling for $4.40 a barrel, or less bag rebate, $4; in paper, the material is selling for $4.40 a barrel, delivered. Providence, R. I., shows no change in the $5.60 figure, although a drop to lower level at an early date would not be surprising; the bag rebate here is arranged at 22½ cents, or 90 cents for the barrel. Newark, N. J., and Philadelphia, Pa., are holding close to New York City prices.

The Atlas Portland Cement Co. resumed operations at its large plant at Northampton, known as Mill No. 4, on February 16, following a shut-down of several weeks. Employment is being given to approximately 400 men at the present time. It is likely that the company will start up other plant units in this district within the next few weeks, and considerable repair work is under way a the various mills preparatory to resumption. At these plants, the regular operatives have been paid off and no promise has been made as to when work would start up. The Lehigh Portland Cement Co. is arranging for the early operation of its Mill "F," at Ormroad, and the plant is expected to go into active production by March 1. At its Mill "B," at West Coplay, a number of repairs are under way, and no notice has as yet been issued as to when the plant will resume.

On account of the curtailment in cement production in the Lehigh Valley district, the Ironton Railroad, which handles the bulk of freight from this section, has placed its working crews and employes on a three-day week basis. Incoming freight, as well, has been at a low status for a number of months past. With a change in the situation, as now being brought about, the railroad expects to go back to normal at an early date.

The Hagerstown, Md., district is taking on the same quickening aspect as found in the Lehigh Valley territory; the Security Lime & Cement Co., Baltimore, has resumed operations at its plant at Security, about two miles from Hagerstown, after a shut-down dating before the holidays. The plant is running at about three-fourths of normal capacity, giving employment to slightly over 200 operatives. Incoming orders for material are encouraging and the indications point to normal operations in the early months to come.

Joining Other Associations

"CO-OPERATION, but not amalgamation with other National Associations," was practically the unanimous verdict after a discussion of whether our Association should combine with a National Mineral Aggregate Association or the National Sand and Gravel Association. Practically every quarryman present believed that "Crushed Stone" was a distinctive and basic industry and that "Crushed Stone" had a much larger meaning and wider use than "mineral aggregate." The action taken at Louisville in 1920 to co-operate with Sand and Gravel or other National Associations in matters of mutual interest was re-affirmed at Toronto. The Toronto Convention believed that the "Monroe Doctrine —friendship with all, entangling alliances with none"— would be the safer policy for quarrymen to pursue.—A. P. Sandles, in Bulletin of the National Crushed Stone Association, February 15, 1921.

Indiana County Withholds Road Construction

BELIEVING that the cost of materials and labor will be considerably lower within the next year, the commissioners in Jackson County, Ind., will order only emergency road repairs and will withhold action on all petitions for new roads. This policy, established more than two years ago, will be continued indefinitely, it was decided at the February meeting. About 20 petitions for new roads, involving an expenditure of thousands of dollars, have been filed, but are continued each session. Many of the improved roads in Jackson County are in a deplorable condition, but J. L. Stilwell, county highway superintendent, contends that the repair fund is not sufficient to maintain them properly. The county has about 550 miles of improved roads and the cost of maintenance in 1920, including expenditures for new equipment, exceeded $63,000, or an average of $118 a mile. Stilwell, in a report, said this fund was adequate to keep about 100 miles of roadway in first-class condition.

Imperial Valley Gypsum Deposits May Soon Be Developed

HINTS at the development of a vast and important industry in the Imperial Valley, Southern California, are gathered from the visit to Calexico recently of E. O. McCormick, vice-president of the Southern Pacific Railway Co. It is expected that the widely-known gypsum deposit on the west side of the Valley will be opened up and developed at a comparatively early date. The steady and growing demand for the gypsum product is the obvious reason for the desire to develop the Valley deposit, which is said to be the largest available gypsum deposit in Western America.

The object of Mr. McCormick's visit was to confer with E. E. Fuller, manager of the Imperial Gypsum and Oil Co., controlling owners of the deposit.

The feature of the plans discussed is reported to have been the building of 25 miles of railroad, from Westmorland to the gypsum deposit. This, Vice-President McCormick is understood to have indicated, may become an accomplished fact in a reasonable time if further investigation verifies the present estimation of the gypsum land.

Accident Prevention

Quarry Accident Prevention

MORE THAN A FOURTH of all the fatal accidents in quarries in 1919, according to the recently issued report of the Bureau of Mines (Technical Paper 275), were caused by explosives. Premature shots caused the largest number of these fatal accidents.

For several years previous to 1919 the most fatal accidents, or rather the most prolific source of fatal accidents at quarries, were slides of rock or over-burden. But in 1919 the fatalities from this cause were less than those caused by either haulage equipment or explosives.

Possibly the reason for this change is the general inefficiency of labor in 1919, and the increased use of inexperienced labor. As there is no part of quarry operation requiring greater experience and care than the storage, handling and placing of explosives, an influx of inexperienced labor due to general conditions would be pretty sure to be reflected in an increase in the number of fatal blasting accidents.

Safe practices in blasting and handling explosives are so well known to every reputable quarry operator that the 1919 statistics only go to show how constantly on his guard every operator must be to see that his foremen and laborers carry out these well-known practices, and why he should never intrust this part of quarrying to any but the most experienced men.

Next to explosions, haulage accidents in and about quarries resulted in a larger number of deaths than that due to any other cause—21.11 per cent of the total due to all causes. Of these fatal haulage accidents 84 per cent were caused by mechanical haulage and railway cars.

Here again inexperience would account for many accidents, but probably a larger proportion are directly due to defective equipment and operation. Railroading is considered a hazardous industry in any event, and it becomes doubly so under the conditions generally found at the average quarry plant.

It may be questionable how far it is desirable to go with quarry transportation systems to put them on a comparable basis with regular railway systems. But let it not be forgotten that one fatality will pay the cost of a lot of track ballasting, properly protecting many switches, properly spiking many rails, and other measures tending not only to safer, but more efficient operation.

Not a few of the larger quarry operators have found by experience that properly ballasted track, well-kept locomotives and rolling stock and a few of the appliances, rules, practices and regulations, which have taken some of the risk out of standard railroading, can be applied with economy, efficiency and profit to their own quarry operations.

Falls or slides of rock or overburden caused 16.67 per cent of all the fatal quarry accidents in 1919. The reduction or the elimination of such accidents is largely up to the quarry operator, for it is his responsibility to say how a quarry shall be opened and operated, and a very great deal of difference in the safety of the operation results in how this is done. Of course, some of these accidents are due to carelessness, which is not chargeable to the geological formation and the method of attacking it, but much can be done in avoiding such accidents by thorough preliminary study, investigation and planning.

Every quarry operation of any size should have a geological engineer, whether he goes by that name or not. He may lack engineering education and experience. He may be a blasting foreman, or a quarry foreman, or a plant foreman. But he should be some one man capable of studying and planning the quarry operation as a whole. He should develop a method of stripping, opening and excavating the quarry face, laying out the transportation system, and like work, so as to involve the least risk to life and limb and the maximum efficiency. Needless to say such men are rare, but well worth a high price when they can be found or developed.

Record for 1919 Better Than 1918

THE SAME REPORT quoted above states that the returns for 1919 are based on reports from 1,724 operators who actually worked their quarries during the year. The number of employes reported was 75,505, of whom 123 were killed and 9,199 injured. The quarries were operated an average of 253 days or a period of time equivalent to 19,138,308 man-days for all employes. The latter figure indicates an increase in the working time of more than seven per cent over the previous year, thus making the slight decrease in the fatality and injury rates during 1919 all the more gratifying. The fatality rate in the quarries producing building stone was 2.15 per 1,000, as compared with 4.23 per 1,000 at those producing crushed stone. The difference in fatality rates in the outside works is similar, the figures being 0.77 for building stone and 1.43 for crushed stone. The non-fatal injuries in the building stone quarries were 136.93 per 1,000 (300-day workers), whereas in the crushed stone quarries they were 240.37 per 1,000 (300-day workers). The non-fatal injuries in the outside works handling building stone were 109.48 per 1,000, as compared with 169.43 per 1,000 in the crushed stone industry.

The principal cause of injuries at quarries producing building stone was flying objects, followed by machinery, and handling rock at the face. At the outside works of building stone quarries most of the injuries were from handling rock by hand and from flying objects.

At quarries producing crushed stone the major causes of non-fatal accidents were handling rock at the face, flying objects, and haulage, in the order named. At the outside works of crushed stone quarries the principal causes of injuries were machinery, and falling objects.

Compared with accidents in coal and metal mines the statistics of the quarry industry still show that there are a great many more accidents than there should be from explosives, from haulage and handling equipment, and from machinery.

The Development of Accident Prevention Activity

SAFETY WORK and its promotion in a plant is similar in nature to the promotion and development of any other commercial activity. First, you must draw upon your own experience and then to judge its correctness or incorrectness you must draw upon the experience of others.

There is available for you at the present time in the National Safety Council Library sufficient material to eliminate all of the experimental element of your accident prevention effort.

Membership will pay you. Write the Business Division today for details.

NATIONAL SAFETY COUNCIL
Co-operative—Non-commercial
168 N. Michigan Ave., Chicago, Ill.

New Machinery and Equipment

New Excavating and Material Handling Equipment

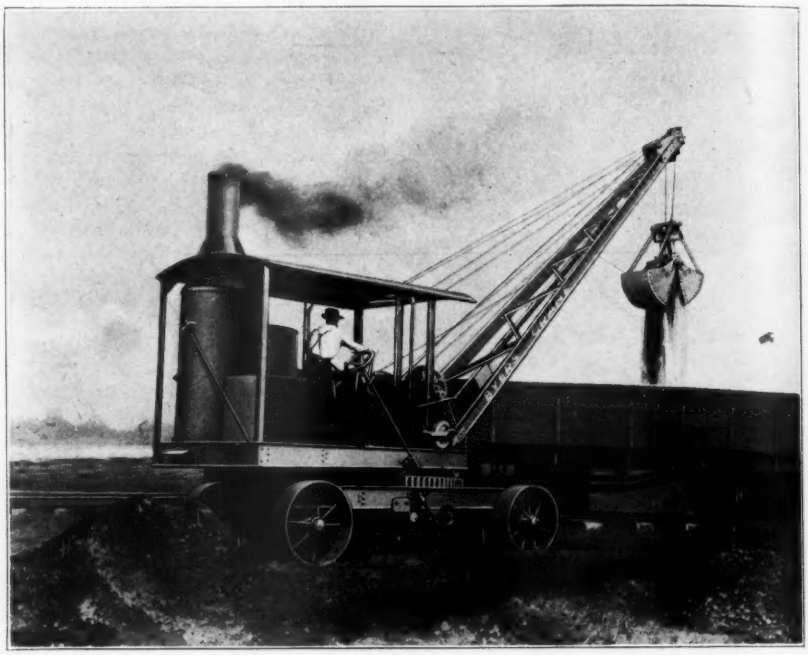
The New Gasoline Shovel

FROM THE AUSTIN MACHINERY CORPORATION comes an important announcement of unusual interest to contractors. An event which they had long hoped for has come to pass—the perfection of a thorough-going, practical gasoline shovel—the new Austin Model 6-T.

This is in no sense a makeshift adaptation of the steam shovel idea, but an entirely new design, built "from the ground up" for gasoline operation, according to the manufacturer's announcement.

Patented air-controlled clutches enable operators to manipulate the principal operations, effectually removing the necessity of the hand-clutch. The cushion-drive clutches of swinging and crowding devices satisfactorily insure the necessary overlapping of operations. All operations may be quickly reversed at any time. The swinging machinery and hoisting drum are locked by means of automatic brakes when the power is shut off.

The following features are claimed for the new shovel: Ease of control; overlapping of crowd, swing and hoist; three-lever digging control; cushion-drive swing and crowd; automatic locking of swing and hoist; "slam the dipper" door (a clean dipper); power boom hoist; quick replacement of clutch bands; interchangeable clutch parts; complete accessibility.



New tractor-mounted crane of the Byers Machine Co.

New gasoline-power shovel of the Austin Machinery Corporation

New Excavator Crane

AS A FURTHER development of its excavating machinery and as an addition to P. & H. Excavator Cranes, the Pawling & Harnischfeger Co. of Milwaukee, Wis., has brought out its No. 206 machine which is a heavy duty, large capacity excavator of the full tractor type. As on the 205 crane, the corduroy traction consists of 20-in. wide cast steel treads. The sprockets which are placed on nine-foot centers are of manganese steel, bronze brushed, and adjustable to take up wear. The short turning radius gives it extreme ease of handling, a complete turn in twice its width being possible. Because no leading wheels are used as on 205, this crane has a still larger radius of operation, getting into locations and over uncertain soil as readily as the now famous tanks did in Europe.

Two traction speeds are provided, one for moving from one location to another over roads or good earth surface, and a lower speed to be used when soft or extremely hilly surfaces are encountered, and when coming out of deep ditches. The power plant consists of a four-cylinder Waukesha heavy duty motor, 50-h.p. Warner vacuum feed, so that fuel is supplied the engine regardless of position of the crane; and a storage tank carried below at rear sufficient to provide for about 20 hours' continuous operation. For use with a ¾-yd. bucket a 30-ft. boom of braced structural steel is furnished, or a 38-ft. boom for a ½-yd. bucket, drag line or clam shell. Back filler, lifting magnet, or slings may replace the bucket for filling or material handling duties.

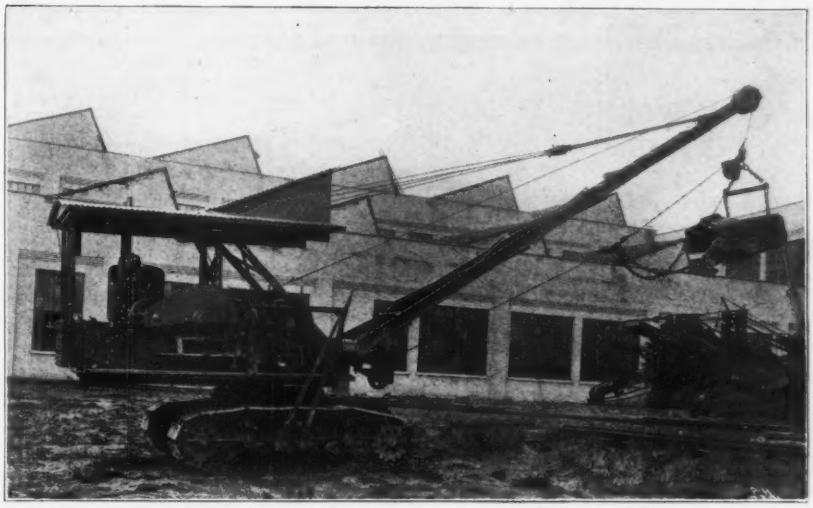
New Small Locomotive Cranes

THREE VIEWS on these two pages show 1921 models of locomotive cranes, particularly designed for use at sand, gravel and crushed stone plants. These cranes are made by the Byers Machine Co., Ravenna, Ohio, the Brown Hoisting Machinery Co., Cleveland, Ohio, and the International Crane Co., Cleveland, Ohio.

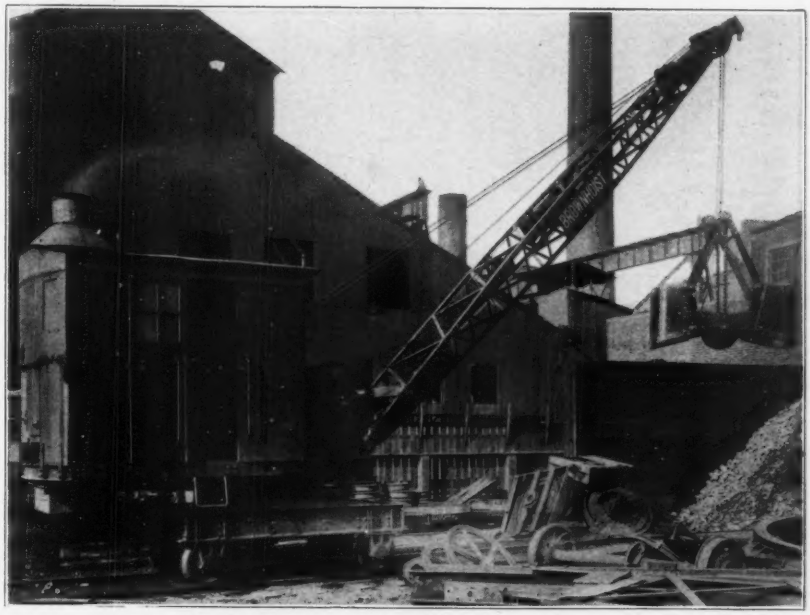
The Byers crane is operated by a steam boiler and engine, or a 45-h.p. gasoline engine or a 40-h.p. electric motor. It has a ¾-yd. bucket for sand and gravel or crushed stone and a radius of 30 ft. The hoisting capacity at 12-ft. radius is 5 tons.

The new Brownhoist is built along the lines of larger cranes of the same type and will perform all the functions of a larger locomotive crane, up to its capacity, such as switching cars. This crane is built to handle a 1-yd. bucket and loads of 5 tons. This crane also is made to operate with steam, gasoline or electric power.

The view of the new No. 38 Universal crane given herewith shows the crane mounted on a steel wheel industrial truck. These wheels are provided with indentations on the inside of the tires so as to fit the rails of a standard-gauge railway track, so the crane may be used on the ground or on the track without change. This crane has a ½-yd. bucket.



Small crane with excavator attachment made by the Pawling & Harnischfeger Co.



New Brownhoist "general utility" small crane

New Universal crane with duplex wheels

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.			1.40 per net ton, all sizes			
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Califon, N. J.	1.80	2.25	2.00	1.80	1.80	.....
Chaumont, N. Y.	1.75	1.75	1.75	1.50	1.50	1.50
Coldwater, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00@2.25‖
Grove, Md.	1.45	2.50	2.40	2.00	1.60	1.45
North Leroy and Akron, N. Y.	.80@1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.			All sizes 1.50			
Redington, Pa. (dolomite)	1.35	.....	1.85	1.85	1.85	1.85
Utica, N. Y.	1.00		All other sizes 1.50			
Vernoy, N. J.	2.00	2.25	2.00	1.80	1.60	.....
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	2.00	1.75@2.00	1.75@2.00	2.00	2.00
Bettendorf, Ia.			All sizes, 2.00 cu. yd.			
Buffalo, Ia.	.....	1.35	1.45	1.25	1.25	1.35
Chicago, Ill.	1.41	2.00	1.53	1.41	1.41	1.41
Cincinnati, Ohio	.....	2.00	2.00	2.00	.....	.....
Cleveland, Ohio	.....	2.40	2.20	2.20	.....	.....
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Coralville, Ia.	1.25	1.65	1.65	1.50	1.40	.....
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*	.....	.....
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.50	1.50	1.25	1.25	1.25	1.25
Illinois, Southern	2.25	1.75	1.75	1.75	1.50	.....
Kokomo, Ind.	1.10	1.10	1.25	1.20	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.70	1.60	1.50	1.50	1.50	1.50
Linwood, Ia.	1.00	.....	1.45	1.25	1.25	.....
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Mayville, Wis.	.95@1.00	.....	1.20	1.20	1.20	1.20
Montrose, Ia.	1.35	1.75	1.75@1.85	1.75	1.65@1.75	.....
Oshkosh, Wis.			1.40 per ton, all sizes			
Ottawa or Hall, Can.	2.00	2.25	2.25	1.75	1.75	.....
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.25	1.25
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Sheboygan, Wis.	1.30	1.30	1.30	1.30	1.30	1.30
Stolle, Ill. (I. C. R. R.)	.....	1.85	1.85	1.85	1.85	1.85
Stone City, Ia.	.....	.80	1.65	1.55	1.45	.....
Toledo, Ohio, f. o. b. cars	1.85	2.10	2.10	2.10	1.85	1.85
Toronto, Canada	1.75	2.40	2.40	2.40	2.15	2.15
SOUTHERN:			These prices include 90c freight			
Cartersville, Ga.	.....	.....	2.00	2.00	2.00	2.00
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
Columbia, S. C.	1.00@1.25	3.50	3.50	3.50	.....	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Fort Springs, W. Va.	1.85	2.00	2.00	1.70	1.60	.....
Garnett, Okla.	.50	.....	1.60	1.60	1.45	.....
Ladds, Ga.	1.75	1.75	1.75	2.00	2.00	.....
Mascot, Tenn.	.....	1.50	2.00	.....	1.50@2.00	.....
New Braunfels, Tex.	.60	1.75	1.75	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.95	1.95	1.85@1.90	1.75@1.80	1.70
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	2.00	.....	.....	.....	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.75	1.65	1.45	1.25	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.60	1.40
Bound Brook, N. J.	2.50	2.75	2.35	2.10	2.10	.....
Dresser Jct., Wis.	.75	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50
E. Summit, N. J.	2.50	3.00	2.75	2.75	2.30	.....
Glen Mills and Rock Hill, Pa.	1.70	2.35	2.05	1.90	1.95	1.80
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	.....
Oakland, Calif.	*1.50	*1.50	*1.50	*1.50	*1.50	*1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	.....
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....
Winchester, Mass.	.85	2.10	1.85	1.60	1.60	1.60

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.—Gneiss	1.00	2.75	2.40	2.20	2.10	1.75
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
W. Barre, Pa.—Quartzite	.90	1.70	1.55	1.20	1.20	1.10
Holton, Ga.—Granite	.40	.....	2.75	2.50	2.25	2.25
Little Falls, N. Y.—Syenite	1.40	1.80	1.70	1.60	1.60	1.50
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Middlebrook, Mo.—Granite	4.00	.....	2.00	2.00	.....	1.50‡
Ottawa, Can.—Granite	5.50	5.00	5.50	5.00	.....	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux ‡Rip-rap. a 3-inch and less.

White Haven, Pa.—Sandstone	1.20	2 00	2.00	1.70	1.70	1.70

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$ — 70% thru 200-mesh, 95% thru 40-mesh; bags, **$5.00; bulk** **3.25**

Chaumont, N. Y.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1.14% — Thru 100 mesh); sacks, 4.50; **bulk** **2.75**

Gasport, N. Y.—90% thru 50 mesh, bulk, 2.50; bags 4.25

Grove City, Pa. — Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 5.50; bulk 4.50

Grove, Md. — (50% thru 50 mesh); paper bags, 6.50; bulk **4.50**

Hillsville, Pa.—Analysis, $CaCo_3$, 96% (70% thru 100 mesh); sacks, 5.00; bulk **3.25**

Jamesville, N. Y.—Analysis, $CaCo_3$, 89.25%; $MgCo_3$, 5.25%; bulk, 2.75; sacks **4.50**

Syracuse, N. Y. — Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk 2.75

Texas, Md. (Analysis, $CaCo_3$, 58.02%; $MgCo_3$, 37.3%; 50% thru 50 mesh); bags, 4.25; bulk 2.50

Walford, Pa. (50% thru 100 mesh; 60% thru 50; 100% thru 10); sacked, 5.00; **bulk** **3.25**

West Stockbridge, Mass., Danbury, Conn., No. Pownal, Vt. — Analysis: $CaCo_3$, 90%; 90% thru 100 mesh; paper bags, 6.25 ..... 3.25

90% thru 50 mesh; paper bags, 5.25; bulk 3.25

Williamsport, Pa. — Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); bulk ..... **4.00@5.50**

CENTRAL:

Alden, Ia.—Analysis, $CaCo_3$, 99.16% ..... **.80**

Alton, Ill. — Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—50% thru 4 mesh 4.50

Pulverized limestone 2.00

Bedford, Ind.—(90% thru 100 mesh) Analysis, $CaCo_3$, equivalent 98.5% .. 1.60@2.00

Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk **2.50**

Cape Girardeau, Mo.—50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 4 mesh 1.50

Columbia, Ill., near East St. Louis (¼-in. down) ..... **1.25@1.80**

Detroit, Mich.—Analysis: 88% $CaCo_3$, 7% $MgCo_3$, 75% thru 200 mesh, 2.50 @4.75; 60% thru 100 mesh ..... 1.80@4.25

Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh **1.25**

Greencastle, Ind.—(Analysis $CaCo_3$, 98%), 50% thru 50 mesh **2.00**

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 ..... 2.75@3.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ 2.00

Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 5.25; bulk 3.00

Mayville, Wis. — $CaCo_3$, 53.65%; $MgCo_3$, 43.72% ..... **1.75@2.00**

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼-in. sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 34.86% thru No. 50; 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, $CaCo_3$, 91.59%; $MgCo_3$, 4.87%—24% thru 200 mesh; 33.6% thru 100 mesh; 40% thru 50 mesh; 50% thru 40 mesh; 70% thru 20 mesh 1.65

Montrose, Ia.—(90% thru 100 mesh)..

Narlo, O. — Analysis, $CaCo_3$, 56%; $MgCo_3$, 43% 1.25

Piqua, O. — Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%— 50% thru 100 mesh ..... 3.50@5.50

50% thru 50 mesh ..... 1.75@2.00

Ridgeville, Ind.—(Analysis $CaCo_3$, 98%), 100% thru 4 mesh **1,75**

River Rouge, Mich.—Analysis: $CaCo_3$, 54%; $MgCo_3$, 40%; bulk ..... .80@1.40

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ¼-in. mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; **$MgCo_3$, 3.82%** **2.75**

Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh) ..... .80

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen) 1.80

Whitehill, Ill.—Analysis, $CaCo_3$, 97.12%; $MgCo_3$, 2.50%—
50% thru 100 mesh 5.00
50% thru 50 mesh 2.25

SOUTHERN:

Cartersville, Ga.—Analysis: 96% combined carbonates—pulverized limestone 2.75

Claremont, Va. (Marlime)—Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50
100 lb. ppr. bags 6.00
100 lb. cloth bags 6.50

Dittlinger, Tex.—Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%—
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00

Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 2.50

Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh 2.00
90% thru 50 mesh 1.50

Ladds, Ga.—Pulverized limestone 2.50

Linnville Falls, N. C.—Analysis, $CaCo_3$, 53%; $MgCo_3$, 42%—50% thru 100 mesh; sacks, 4.50; bulk 3.00

Marion, Va.—Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.50

Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ½ in. down 2.00

Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 3.00
(All thru 10 mesh) 2.50
(80% thru 200 mesh) 5.00
Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.

Maxwell, Va. 2.50

Mountville, Va.—Analysis, $CaCo_3$ 76.6%; $MgCo_3$, 22.83%—100% thru 20 mesh; 100 lb. ppr., 7.00; bulk 5.50

Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50

Tyrone, Ky.—Analysis, $CaCo_3$, 90%; $MgCo_3$, 4%—90% thru 4 mesh ..... 1.75@2.25

WESTERN:

Cement, Calif.—Analysis, $CaCo_3$, 95%; $MgCo_3$, 2%—(50% thru 50 mesh) 5.00

Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½% (all to pass 14 mesh)—bulk, 3.50; bags 4.50
Sacks, 15c extra, returnable.

Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 2.00

Oro Grande, Calif.—Analysis: $CaCo_3$, 94%; $MgCo_3$, 2%; 85% thru 200 mesh; $4.00, bulk; bags 10.25

Terminus, Calif.—Analysis, 96.4% $CaCo_3$, 1.3% $MgCo_3$—(60% thru 200 mesh; 80% thru 100 mesh; 100% thru 50 mesh); sacks, 6.00; bulk 5.25

Tulsa, Okla.—90% thru 4 mesh ..... .65

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Beach City, O.—Washed and screened 3.00
Berkeley Springs, W. Va. 2.75
Bridgeton, N. J.—Washed, 2.50; dried 3.00
Cedarville and South Vineland, N. J. ..... 1.25@3.00
Columbus, Ohio ..... 2.50@3.00
Gray Summit, Mo. ..... 2.50@4.00
Hancock, Md.—Damp 2.00
Klondike and Pacific, Mo. ..... 2.50@3.00
Leesburg, Pa.—Core, and molding coarse 3.00
Mapleton, Pa.—Dry 4.00
Glass, damp 3.00
Massillon, Ohio 3.50
Millington, Ill. ..... 2.25@3.00
Mineral Ridge, Ohio 3.60
Montoursville, Pa.—Green, washed ..... 2.00@2.75
Morgantown, W. Va. ..... 3.00@3.25
Oregon, Ill.—Large contracts ..... 2.00@2.75
Ottawa, Ill. 2.50
Pittsburgh, Pa.—Dry, 4.00; damp 3.00
Robinson, Md.—Washed, damp 2.00
Rockwood, Mich. 3.50
Round Top, Md.—Glass and damp, $2.50; core 2.25
St. Marys, Pa.—Green 3.00
Sands, Elk Co., Pa.—Selected, green 2.75
Thavers, Pa.—Washed 2.50
Tygarty, Ky.—Washed, not dried 2.60
Utica, Ill. ..... 1.75@2.50

FOUNDRY SAND:

Ableman, Wis.—Brass molding and molding fine 3.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		1.30		1.30	1.00	1.00
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Erie, Pa.		1.00	1.15		1.25	
Farmingdale, N. J.	.48	.48			1.40	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.60@.75	2.00	1.75	1.65	1.50
Ludlow, Mass.	.75*	.75*	1.70		1.50*	1.50*
Pittsburgh, Pa.		1.30@1.50			1.00	1.00
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.75	.75	2.00	1.40	1.20	1.20
York, Pa.		1.10@1.30	(crushed gravel)			
CENTRAL:						
Alton, Ill.		.85				
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.70		.80	.80	.80
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, O., and vicinity	1.20	1.15	1.15	1.15	1.15	2.00
Columbus, O.		.90	.90	.90	.90	.85
Des, Moines, Ia.	1.00	.75	1.60	1.60	1.60	1.60
		25% gravel, 1.00; 50% gravel, 1.20				
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.40@.50	.50@.70	1.00@1.25		1.00@1.10	1.00@1.10
Elgin, Ill.		.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.65	.57	1.00	.77	.77	
Grand Rapids, Mich.		.60		.90	.85	
Greenville, Mechanicsburg, O.	.80	.70	.80	1.00	.85	.80
Humboldt, Ia.		1.35	2.20	2.20	2.20	2.20
Indianapolis, Ind.	.60	.60		1.50	.75	.75
Janesville, Wis.		.65@.75			.75@.85	
Le Mars, and Doon, Ia.		.90		1.80		
Lincoln, Neb.	Sand .80, sand and gravel 1.30, drained for shipment					
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.40	1.40	1.40	1.40	1.40	1.40
Minneapolis, Minn.	.50	.50	2.00	2.00	1.75	1.50
Moline, Ill.	1.40	1.60	1.90	1.90	1.90	1.90
Pittsburgh, Pa.		1.30	1.30		1.00	1.00
Riton, Wis.		.85				.85@1.00
St. Louis, Mo., f. o. b. cars	1.95	1.65	1.85	1.65	1.60	1.60
Summit Grove, Clinton, Ind.	.90	.90	.90	1.00	1.00	1.00
Terre Haute, Ind.	1.00	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	.75	.75				
Yorkville, Moronts, Oregon and Sheridan, Ill.	.90	.90	.90	.90	.90	.85
SOUTHERN:						
Alexandria, La.	.70@.90					1.65@1.85
Charleston, W. Va.		Sand 1.40@1.50—Gravel 1.50				
Flomaton, Ala.		1.00		2.25		
Ft. Worth, Tex.	2.00@2.25*	2.00@2.25*	2.75@3.00*	2.75@3.00*	2.75@3.00*	
Greenville, Miss.		1.10				1.00
Jedburg, Mo.		1.05	1.20@1.45	1.00	1.00	.95
Knoxville, Tenn.	1.00@1.15	1.00@1.15	1.60	1.60	1.60	1.40
Lake Weir, Fla.		.75				
Macon, Ga.		.75@1.00				
Memphis, Tenn.	1.40	1.40	1.50			1.50
N. Martinsville, W. Va.		1.30				1.00
New Orleans, La.	1.00		1.75		1.25	
Pelzer, S. C.	.90					
Pine Bluff, Ark.	1.25	.92	Washed gravel, all sizes, 2.10			
Roseland, La.		.60	1.40			
Tulsa, Okla.		.70				
Waco, Texas	.70@.80	.70@.80				
WESTERN:						
Denver, Colo.	.50*					
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	1.00	1.00	.90@1.10	.85@1.00	.85@1.00	.85@1.00
Porteau, B. C.	1.30	1.30	1.30			1.20
Pueblo, Colo.	.95	.90				2.00
Roseburg, Ore.	2.00	1.75	2.00	1.75	1.75	1.75
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.25@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25	1.25	2.00	1.25	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@.80		.55@.75			1.00
Glenville, N. Y.				1.00*		
Hartford, Conn.		1.00*				
Yardville, N. J.		.50@.75				
York, Pa.		1.00@1.30		(crushed rock sand)		
CENTRAL:						
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Hawarden, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10*					
Elkhart Lake, Wis.		.80 per ton (washed concrete material)				
Ft. Jefferson, Mechanicsb'g, O.	.70	.60	.60			
Hersey, Mich.		.60	.60	.60	.60	
Janesville, Wis.		.65			.75	
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo., f. o. b. cars						1.75
Summit Grove, Ind.	.65	.65	.65	.65	.65	.65
Yorkville, Oregon, Moronts and Sheridan, Ill.						.80@.90
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)		1.15		1.10		
Lindsay, Tex.	.85				.60	
Valde Rouge, La.						.85
Waco, Texas		.80		1.50		1.30

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	**2.50**	**.90**	**1.50**	**1.20**	**1.20**	**1.20**	**1.20**
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	
Eastern Pennsylvania and Northern New Jersey	**2.50**	**.90**	**1.50**	**1.10@1.25**	**1.10@1.25**	**1.10@1.25**	**1.10@1.25**
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Hokendaugua and Donaghmore, Pa.	**2.50**	**.90**	**1.50**	**1.20**	**1.20**	**1.20**	**1.20**
Lebanon, Pa.	**2.50**	**.85**	**1.50**	**.85**	**.85**	**.85**	**.85**
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	**2.50**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Ensley, Ala.	**2.05**	**1.00**	**1.25**	**1.25**	**1.25**	**1.00**	**.95**
Longdale, Goshen, Glen Wilton and Low Moor, Va.	**2.50**	**1.00**		**1.25**	**1.25**	**1.15**	**1.05**

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		7.50@8.00	72		
Bellefonte, Pa.	9.00		95.5		
Berkeley, R. I.			**50**	**18**	**15.00**
Branchton, Pa.		5.50			
Cassadaga, N. Y.—Marlime	8.00		48.07	1.08	
Cavetown, Md.	**8.50**				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	10.50		45.50	30.50	13.00
Chippewa, Pa.	6.00		78.67	1.33	
Farnams, Mass.	5.00	6.50	60	2	
Frederick, Md.	**7.75**		**88**	**5 to 8**	**10.50**
Grove, Md.	**8.00**				**10.75**
Highgate Springs, Vt.	**6.00**		**85**	**2**	**8.00**
Hot Springs, N. C.	3.25	4.75			
Hyndman, Pa.	**5.00**	**8.50**	**80.23**	**2.87**	
Lime Ridge, Pa.	6.00@7.50		80.56-62.71	3.87-1.96	
Mt. Union, Pa.	**6.25**		**93.69**		
Newburgh, N. Y.			**57**	**38**	**8.00**
New Castle, Pa.	**3.50**	**4.50**	**47.6 to 50.4**	**0.62 to 1.12**	
Paxtang and Lemoyne, Pa.	5.00@6.00		60	3	
Rockland, Maine		8.00	65	1	
Rosendale, N. Y.	**8.00**	**9.00**	**92**	**5**	
Texas, Md.		9.00			
Union Bridge, Md.	**11.00**	**5.50**	**73**	**1**	**13.00**
Williamsport, Pa.	6.25	12.00	84-87	2-3	12.00
West Rutland, Vt.	**5.00**	**8.00**	**68**	**3**	
West Stockbridge, Mass.	**3.35**	**5.35**			**12.00**
Williams and Blue Bell, Pa.		8.25	57	33	11.25
York, Pa.	9.50	13.00	92.5	3.5	11.75
CENTRAL:					
Alton and Hannibal, Ill.	11.50		.95		
Delaware, O.			50.0	5-12	11.10
Knowles and Valders, Wis.	5.00	9.00	55	45	12.50
Manistique, Mich.	**11.00**		**95**	**2**	**11.00**
Marblehead, O.			85.10	12.92	12.00
Mitchell, Ind.					12.50
Sheboygan, Wis.	**5.50**	**8.50**	**58**	**40.5**	
Woodville, Ohio			47.50	31.60	8.00@12.00
SOUTHERN:					
Blowers, Fla.	3.25		98		
Burns, Tenn.	9.50		96	0.54	12.00
Chippewa, Fla.	**5.00**		**80.0**	**15.0**	
Claremont, Va. (Marl.)	5.00	7.00	85-95	2-5	
Dittlinger, Texas		**9.00@11.00**	**98.62**	**0.29**	**12.50@15.00**
Erin, Tenn.	10.00		97.82	0.12	
Karo, Va.	9.00		97	1.25	
Knoxville, Tenn.	10.00		98.4	1	13.00
Lushing, Va.	**9.00**	**11.25**	**60**	**15**	**12.75**
Maxwell, Va.	**6.50**		**84**		**6.50**
Newala, Ala.	**10.00**		**99.33**		
Ocala, Fla.	**4.00**	**6.00 pulv.**	**98½ (dry basis)**		
Staunton, Va.	8.00	10.50	85	10	
WESTERN:					
Colton, Calif.			97	2	15.00
Kirtland, N. Mex.	12.50				
San Francisco, Calif.		15.00	97	0.33	15.00
Tehachapi, Cal.	6.00	8.00	96	2	
Orofino, Idaho	6.50	8.57	95	2.16	

Miscellaneous Sands

(Continued from preceding page)

Albany, N. Y.—Glass and sand blast	2.00@4.00
Core	1.65@2.50
Furnace lining	2.00@3.00
Molding fine, coarse and brass	2.50@3.00
Allentown, Pa.—Core	1.50@1.75
Molding coarse	1.50@1.75
Arenzville, Ill.—Molding fine	1.70@1.90
Beach City, O.—Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Bowmantown, Pa.—Core	1.35@1.50
Molding, coarse	1.80@2.00
Bridgeton, N. J.—Core	**2.00**
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	**1.50@2.00**
Molding fine	**1.50@2.00**
Core	**1.25@1.50**
Columbus, O.—Core	1.00@3.00
Brass molding	**3.50@4.00**
Glass sand	**3.00**
Molding fine and coarse	3.00
Conneaut, O.—Molding fine	**2.25@2.50**
Molding coarse	**2.00@2.25**
Delaware, N. J.—Molding fine	2.00
Molding, coarse	**1.90**
Brass Molding	**2.15**
Dresden, O.—Core	1.75
Molding fine and coarse	2.00
Brass molding	2.50

Miscellaneous Sands

(Continued)

Dundee and Chalfants, O.—Core	3.25
Glass, sand blast and traction	3.00
Molding fine, brass molding	3.75
Molding coarse	3.25
Furnace lining	2.75
Eau Claire, Wis.—Core	1.00@1.25
Roofing gravel	1.00@1.25
Sand blast	3.00@4.25
Traction sand	.40@ .60
Fleetwood, Pa.—Furnace lining	**2.25**
Franklin, Pa.—Traction	**2.25**
Brass molding	**2.50**
Core	**3.00**
Molding fine	**3.00**
Molding coarse	**3.00**
Sand blast	**5.00**
Greenville, Ill.—Molding coarse	1.80@2.00
Hancock, Md.—Core and brass mldg.	**1.65**
Hellam, Pa.—Core	**2.00@2.50**
Joplin, Mo.—Stone sawing, flint	**1.25**
Kansas City, Mo.—Missouri River core	**.80**
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp	**2.50**
Core, furnace lining, moulding, fine and coarse, dry	**3.00**
Massillon, O.—Molding fine	4.00
Core and molding, coarse	3.50
Glass sand	4.00
Traction	3.50
Furnace lining	4.00
Michigan City, Ind.—Core, glass, traction and brass molding	.60
Millington, Ill.—Glass, core, furnace lining, roofing and stone sawing	2.00
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	3.00
Montoursville, Pa.—Core and traction	**1.50@2.00**
Brass molding	1.75@2.25
Glass sand	2.00@2.75
New Lexington, O.—Molding fine	3.50
Molding coarse	**3.25**
Oregon, Ill.—Core sand	3.00
Potter's flint	9.50
Steel molding	1.25
Plasters' molding	2.50
Sand blast	2.25@2.75
Placing sand	3.50
Ottawa, Ill.—Crude silica sand	**1.25@1.75**
Ottawa, Ill.—Core, furnace lining, steel molding	2.50
Sand blast	5.00
Glass sand	**2.00@2.50**
Roofing sand	2.50@5.00
Ridgeway, Pa.—Glass sand, green	**2.25**
Glass sand, wash	**2.50**
Molding, fine and coarse	**1.20**
Rockwood, Mich.—Core	3.00@3.50
Roofing, stone sawing	3.50
Sand blast	4.00
St. Peter, Minn.—Glass sand	2.25
Core sand	2.25
Brass molding	2.25
Molding fine	2.25
Thayer, Pa.—Traction	2.00
Furnace lining	1.10
Molding fine and coarse	1.00@1.25
Core, green	2.00@2.25
Tygarty, Ky.—Core and stone sawing	**2.60**
Fire-brick sand, washed but not dried	**2.15@2.40**
Utica, Pa.—Core	3.00
Molding fine	3.00
Molding coarse, traction	3.00
Brass molding	3.00
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	**2.75**
Same, green	**2.50**
Wedron, Ill.—Core (crude silica)	1.10@1.25
Molding fine	1.10@1.25
Furnace lining	1.25
West Albany, N. Y.—Molding fine	2.25
Molding coarse	2.25
Winnipeg, Man., Can.—Roofing sand	*4.00
Zanesville, Ohio—Molding fine and brass	2.50
Molding coarse	2.25

Crushed Gypsum

Blue Rapids, Kan.—Crushed	3.50
Castalia, O.—Crushed, to cement mills	3.50
Ft. Dodge, Ia.—Bulk	4.00
Grand Rapids, Mich.—Crushed gypsum rock	3.50
Gypsumville, Man., Can.—Crushed	**3.50**
Oakfield, N. Y.	**4.00**
Gypsum, O.	3.50
Port Clinton, O.—Crushed gypsum	3.50
Saltville, Va.	**4.50**

(Gypsum) Land Plaster

Castalia, O.—Land plaster	5.50
Bags extra—Jute, 3.00; ppr., 1.00.	
Garhutt, N. Y.—Land plaster, bags	7.50

(Continued on next page)

(Gypsum) Land Plaster.

	Bags extra
Grand Rapids, Mich.—Ground gypsum rock	4.50
Land plaster	7.50@9.50
(Continued from preceding page)	
Mound House, Nev.—Ground gypsum rock	7.00@8.00
	Sacks, .25 extra
Oakfield, N. Y.—Ground Gypsum rock	7.50
Plasterco, Tex.	12.00
Sandusky, O.	6.00
Jute, 3.00 extra; ppr., 1.00 extra.	
Los Angeles, Calif.	12.50
Winnipeg, Man., Can.—Ground gypsum rock	4.50@5.00

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	9.00@10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centerville, Tenn.—B. P. L., 65%	8.00
B. P. L., 70%	9.00@10.00
Brown rock, 75% and better	12.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 68%	6.50@7.00
B. P. L., 70%	7.50@8.00
B. P. L., 72%	8.50@9.00
Mt. Pleasant, Tenn.—(B. P. L. 68%) 13% phosphorus	7.50@9.00
14% phosphorus	8.00
Mt. Pleasant, Tenn.—B. P. L., 65-70%	7.00@8.50
Norwills, Fla.—Fla. Hard Rock (B. P. L., 68%)	10.00
Wales, Tenn.—(B. P. L., 70%)	8.00

Florida Soft Phosphate

Bartow, Fla.—B. P. L., 60%, bulk	10.00
Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Norwills, Fla.—B. P. L., 60%, bulk	10.00
Phoslime, Fla. (in burlap bags)	15.00
Morriston, Fla. (24% phosphoric acid)	16.00
Lakeland, Fla. (N. B. P. L.)	13.50

Portland Cement

Current warehouse prices, carload lots at principal cities, without bags:

New York (del.)	$3.10
Jersey City (del.)	2.89
Boston	3.41
Chicago	2.37
Pittsburgh	2.42
Cleveland	2.73
Detroit	2.78
Indianapolis	2.61
Toledo	2.71
Milwaukee	2.59
Duluth	2.35
Peoria	2.63
Cedar Rapids	2.71
Davenport	2.67
St. Louis	3.45
San Francisco	3.09
New Orleans	3.76
Minneapolis	3.00
Denver	3.25
Kansas City	2.76
Lincoln, Neb.	3.05
Seattle	3.10
Dallas	2.85
Atlanta	3.00
Cincinnati	3.32
Los Angeles	3.21
Baltimore (del.)	2.93
Montreal (including bags)	3.52
Winnipeg (including bags)	4.28

NOTE—Bag charge is generally 25c each.

Natural Cement

Current price for 500 bbl. or over, f.o.b., exclusive of bags:

	Current
Minneapolis (Rosendale)	$2.80
Kansas City (Ft. Scott)	1.60
New Orleans	3.36
Atlanta (Magnolia)—ton	11.00
Cincinnati (Louisville)	2.75
Boston (Rosendale)	2.35

Roofing Slate

The following prices are per square (100 sq. ft.) for slate, f. o. b. cars, quarries, Bangor, Penn.

No. 1 Clear Slate

Sizes	Price
24x14	10.85
24x12	10.85
22x12	11.55

Roofing Slate

(Continued)

22x11	11.55
20x12	11.55
20x10	12.60
18x12	11.90
18x10	12.60
18x 9	12.60
16x12	11.90
16x10	12.60
16x 9	12.60
16x 8	12.60
14x10	11.90
14x 8	11.90
14x 7	11.20
12x10	11.20
12x 8	11.20
12x 7	11.20
12x 6	11.20
10x 8	9.10
10x 7	9.10
10x 6	9.10

No. 2 Clear

24x12	8.75
22x11	8.75
20x10	9.45
18x10	9.45
18x 9	9.45
16x 8	9.10
14x10	9.10
14x 8	9.10

No. 1 Odd Sizes

18x18	13.30
16x16	13.30
14x14	13.30
12x12	13.30

The following are the prices per square for slate, f.o.b. cars quarries, Granville, N. Y., the prices given in each case being for No. 1 Sea Green Roofing Slate:

22x11, 20x12, 20x11, 20x10, 18x12, 18x10, 18x9, 16x12, 16x10	11.90
16x12, 16x10	11.90
24x12, 22x12, 16x9, 16x8, 14x12, 14x10	11.55
26x14, 24x14, 22x14, 20x14	11.20
14x9, 14x8, 12x10	10.50
14x7, 12x9, 12x8	9.80
12x7, 11x8, 11x7, 10x8	9.10
12x6, 10x7	8.40

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50@8.00.

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finished	Common
New York	$21.00	$20.00
Kansas City	27.20	26.20
Chicago	20.00	.....
St. Louis	26.00	20.00
Boston	28.00	27.00
Dallas	.....	25.00
Cincinnati	19.50	17.60
San Francisco	25.40	22.00
Minneapolis	27.00 (white)	22.00
Denver	32.00	.....
Detroit	22.00	19.00
Seattle	27.00	.....
Los Angeles	30.00	30.00
Baltimore	24.00 (East)	.....
Montreal	25.00	.....
Atlanta	.....	18.00
New Orleans	24.50	24.50

	Lump per Finished	200-lb. Barrel Common
New York	$ 3.50 at plant	$ 3.30*
Kansas City	2.50	2.40
Chicago	.....	1.75
St. Louis	.....	4.12½*
Boston	.....	3.75†
Dallas	.....	2.50†
Cincinnati	.....	2.10‡
San Francisco	.....	2.25
Minneapolis	2.00	1.80
Denver	1.05 (bu.)	.....
Detroit	2.00†	1.80†
Seattle	3.25†	.....
Los Angeles	3.00*	3.00*
Baltimore	.....	13.00‡
Montreal	15.00‡	.....
Atlanta	.....	2.25†
New Orleans	2.70	2.25

*300-lb. barrels. †Per 180-lb. barrel. ‡Per ton.
NOTE—Refund of 10c per barrel with 25c per ton off on hydrated.

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Talc

(Continued)

Baltimore, Md.—Crude talc	4.00
Cubes	50.00
Blanks, per lb.	.07
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.00@3.25
Ground talc (20-50 mesh), bags	8.50@9.00
Ground talc (150-200 mesh), bags	11.25@13.75
Chester, Vt.—Ground talc (150-200 mesh), bulk, 10.50@12.00; bags	12.00@14.00
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@2.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags extra)	
Ground talc (150-200 mesh), bulk, 10@15.00 and	10.00@15.00
(Bags extra)	
Pencils and steel workers' crayons, per gross	2.00
Biltmore, N. C.—Ground talc (150-200 mesh), 200-lb. bags	15.00@30.00
Pencils and steel workers' crayons, per gross, 1.25@1.45 and	1.55@1.60
School crayons, per gross	1.15@1.20
Roller mill crayons, per gross	1.75@1.90
Keeler, Calif.—Ground talc (150-200 mesh), bags	15.00@30.00
(Bags extra)	
Gouverneur, N. Y.—Crude talc	4.00
Ground talc (150-300 mesh)	17.00@24.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@21.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (20-50 mesh) 200-lb. bags	12.00
Ground talc (150-200 mesh) 200-lb. bags	20.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	16.00@20.00
Glendale, Calif.—Ground talc (150-200 mesh)	16.00@30.00
(Bags extra)	

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Michigan City, Ind.	14.00
Milwaukee, Wis. (delivered at job)	18.50
Barton, Wis.	15.00
South Dayton, Ohio	16.50
Albany, Ga.	16.00
Brighton, N. Y.	20.50
Buffalo, N. Y.	16.50
Winnipeg, Can. (less $1 trade disc.)	19.00
Boston, Mass.	19.00
Syracuse, N. Y. (delivered at job)	27.00
F. o. b. cars, plant	25.50
Washington, D. C.	15.50
San Antonio, Texas—Common	20.00
Face	25.00@32.00
Boise, Idaho (in yard)	18.00
El Paso, Texas	15.00
Rochester, Mich.	13.00
Bloomfield, Ont., Can.	18.00
Plant City, Fla.	17.00
Grand Rapids, Mich.	15.00
Lancaster, N. Y.	16.50
Portage, Wis.—Common	18.00@20.00
Face	30.00@35.00
Toronto, Can.	17.00
Saginaw, Mich.	17.00

Cement Brick

Prices given per 1,000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Houston, Tex.	$ 21.00	$27.00
Eau Claire, Wis.	18.00@22.00	.....
Bellow Falls, Vt.	25.00	35.00
Portland, Ore.	28.00	48.00@75.00
Fancy brick	100.00@150.00	
St. Paul, Minn.	18.00	30.00@32.00
Omaha, Neb.	29.00@32.00	40.00@45.00
Piqua, O.	20.00	25.00@30.00

News of the Industry

Incorporations

The Lowell Sand & Gravel Co., Lowell, Mich., has been incorporated for $125,000.

Kaltz Bros. & Kelly, Ferndale, Mich., has been incorporated for $30,000 to handle building material.

The Braham Mercantile Co., Braham, Minn., has been incorporated for $50,000, and will handle building material.

The Pen-Texas Gravel Co., Dallas, Tex., has been incorporated for $5,000 by T. Jackson, C. Kraft and J. A. Roddie.

The Pratt Granite Co., Barre, Vt., has been incorporated for $10,000 by C. A. Brown, G. O. Pratt and G. S. De Merell.

The Alaska Marble Quarries, Seattle, Wash., has been incorporated for $200,000, by W. F. Woodbridge and A. C. Jenkins.

The Muste-Dykstra Co., Grand Rapids, Mich., has been incorporated for $10,000, to manufacture and sell stone, granite and marble.

The Maryland Concrete Corp., Baltimore, Md., has been incorporated for $50,000 by Jacob Gouline, Louis Marcus and E. H. Young.

The Cementile Products Co., Roanoke, Va., has been incorporated for $50,000, by M. M. Caldwell, president; Geo. W. Chaney, secretary, and others.

The A. A. Laun Co., New Holstein, Wis., has increased its capitalization from $60,000 to $100,000. The company deals in all building materials.

Wautoma Mercantile Co., Wautoma, Wis., has been incorporated for $75,000 by A. J. Walker, W. H. Beach and O. T. Melcher to deal in all building materials.

The Quality Sand and Gravel Co., Wheeling, W. Va., has been incorporated for $50,000 by R. L. Dowell, R. J. Cotts, T. S. Thomas, Ed. Burkhart and C. T. Abrams.

Pitho-Plastic Board Co., Buffalo, N. Y., has been incorporated for $100,000 by J. A. Lockhart, 423 Breckenridge St., Buffalo, to manufacture composition plaster board.

The Fletcher & Crawford Co., Orlando, Fla., has been incorporated for $25,000, to handle building material. C. F. Crawford is president and J. W. Fitzgerald is secretary and treasurer.

Excelsior Sand Co., Massillon, O., has been incorporated for $25,000 to produce and sell sand. The incorporators are A. J. Place, H. W. Loeffler, O. J. Sorg, Edwin Smith and M. R. Tombow.

The Co-Operative Phosphate Co., Mulberry, Fla., has been incorporated for $500,000 by L. N. Pipkin, H. W. Wear, J. J. Swearington and A. D. West. The company will mine and manufacture phosphate products.

The Macon Sand Co., Macon, Ga., has been organized and incorporated for $1,000 with authorization to increase this to $25,000, by B. B. Taylor and K. M. Trowbridge. The company will handle sand and gravel.

The Ajax Supply Co., Milwaukee, Wis., has been incorporated for $15,000 by F. A. Thielacker, J. J. Weiher and S. L. Klarer. The company does construction work on roads, buildings, sewers, etc., and deals in all building materials.

The Logansport-Greenville Gravel Co., Greenville, O., has been chartered with a capital of $300,000 to produce and sell sand and gravel. The incorporators are F. D. Coppock, C. E. Patty, H. R. Brown, J. F. Coppock and I. C. Baker.

The Marble Stone Co., Des Moines, Ia., has been incorporated for $20,000 to manufacture asbestos products and roofings of all kinds by F. Perkins, Pres.; S. S. Jones, Vice-Pres. and Gen. Mgr.; A. J. Crawford, Sec'y-Treas., all of Des Moines.

The Waterhouse Sand and Cement Products Co., Oral, S. D., has been incorporated for $15,000 by F. A. Waterhouse, Oral, S. D.; Miss C. L. Waterhouse, New York, N. Y., and L. E. Wight, Oral, S. D. The company will deal in crushed rock, sand and cement products.

The Golden Gravel Co., Golden, Miss., has been incorporated for $50,000, with J. N. Stone, Nashville, Tenn., as president; Leo F. Miller, vice-president and Geo. T. Wofford, secretary and treasurer, both of Johnson City, Tenn., and Charles P. Wofford, assistant secretary and treasurer, Golden, Miss.

Quarries

The Georgia Cement & Stone Co., Atlanta, Ga., is in the market for both jaw and gyratory crushers of large size.

Hickley Morrison, 16½ N. 9th street, Richmond, Va., is in the market for machinery for crushing feldspar and mica.

The Paveglio Granite & Marble Co., of Marquette, Mich., has changed its name to the Peninsula Granite & Marble Co.

The Virginia Marble & Onyx Co., Huntington, W. Va., of which James A. Young is president, has increased its capital stock from $50,000 to $150,000.

Edward German, Slatington, Pa., is arranging for the opening of a new slate quarry on his property near Lehigh Gap. Operations will commence at an early date.

Uniontown, Pa.—Fayette county commissioners are negotiating for the lease of a stone quarry on the William Henshaw farm, adjoining the county poor farm. It is proposed to operate the stone quarry with county prison labor.

The State Highway Department, Harrisburg, Pa., is arranging for the construction of a new stone crushing plant at Drums, near Hazleton, Pa., to be used for road work in this district. It is proposed to equip and operate the new plant at an early date.

The Farmers Ground Limestone Co., New Paris, O., has been reorganized, with W. L. Hahn, S. C. Richie and S. S. Kilbourne as members of the board of directors. C. W. Gregg, of Richmond, will have charge. They expect to erect a modern crushing plant at once and be able to take care of the spring business.

Macon, Ga.—Receipt of a rush order which would have kept the company busy for some time caused the resumption of activity at the A. T. Small quarries in Macon, Ga., recently, after a period of idleness extending over several weeks. The company operated one day and as the order was then cancelled was compelled to again shut down the quarries. Officials announce they expect to resume full operations now about March 1.

Sand and Gravel

Edward Hely, Cape Girardeau, Mo., manufacturer of crushed stone announces he is now a shipper of Mississippi river sand also.

The Belmont Sand & Gravel Co., Grand Rapids, Mich., is being organized to conduct a sand and gravel business in the vicinity of Belmont, Mich.

The Warsaw Sand and Gravel Co., has sold its pits and gravel washing machinery near the Winona Lake Pennsylvania station to the Western Indiana Gravel Co., Terre Haute, Ind.

Peru, Ind.—Sand and gravel men are considerably interested in the plans of the city of Peru to construct huge walls for flood prevention. Plans are now being completed by a St. Louis engineer and preliminary estimates fix the total cost at $1,000,000.

The Burress Gravel Co., Shoals, Ind., is now in operation and a big business is anticipated for the coming spring and winter as a great deal of building has been planned for Shoals. A business block, several garages and a number of dwelling houses will be built in Shoals. The company gets its supply of gravel from White river, that flows through Shoals.

Evansville, Ind.—The steamer Green River with digger and five barges, owned by the Evansville Sand and Gravel Co., left Mt. Vernon, Ind., recently to go to Maunee, Ill., on the Wabash river, a short distance from New Harmony, Ind., to begin their spring gravel digging. The company's supply in its yard at Mt. Vernon has been rather low for some time past.

The Quality Sand & Gravel Co., Glendale, W. Va., recently organized, is planning for the operation of properties in the vicinity of Moundsville, W. Va. The company has a tract of about 25 acres of land, and will construct and equip a plant to provide a daily output of about 600 tons of sand and gravel. In addition to regular operating machinery, power plant equipment will be installed. R. L. Dowell is president.

The Druecker Sand and Gravel Co., Shorewood, Wis., has increased its capitalization from $1,000 to $35,000. The president of this company is John P. Druecker.

The Eau Claire Sand and Gravel Co., Eau Claire, Wis., has increased its capitalization from $75,000 to $150,000. F. E. Nicoles is president of the company; T. B. Fleming, secretary and A. O. Ayres, general manager.

The Corliss Sand Co., New Martinsville, W. Va., and the New Martinsville Sand Co., New Martinsville, W. Va., have been consolidated and will be operated hereafter as the New Martinsville Sand Co. Charles Corliss will become the president and general manager of the consolidated companies just as soon as a board of directors for the consolidation is chosen. The new corporation will have a capital stock of $150,000.

The Macon Sand Co., Macon, Ga., is arranging for extensive operations on river front property; a river dredge will be placed in operation, with screening plant, and it is planned to develop a daily output of about 400 tons of material. The company was recently organized with B. B. Taylor as manager. Plans for the plant are being prepared by M. M. Trowbridge, consulting engineer, Fourth National Bank Building, Atlanta, Ga.

Griffith, Ind.—Announcement has been made of the formation of the Griffith Sand and Gravel Co., at Griffith, Ind. The company recently filed incorporation papers with the Secretary of State at Indianapolis, showing a capital stock of $20,000. Officials of the company say that they now are looking for suitable sand and gravel deposits and will enter active production early this spring. The directors are, James J. Nejdl, Carl Lundrum and Walter E. Schrage.

Sea Isle Junction, N. J., and vicinity report that there is intensive production under way at the sand properties and with the fine open weather, producers are making every day count. The demand for material maintains with a vim, and orders are being received from practically all districts supplied by this section. The sand pits are giving employment to a large number of men, and production is being pushed to a point of including overtime. From 20 to 30 carloads of material are leaving this vicinity daily.

The Casco Gravel Co., Green Bay, Wis., was stated as increasing its capitalization by $10,000 in the Jan. 29 issue of Rock Products. This is erroneous, in that the company has issued the following statement: The Casco Gravel Co. was organized with capital stock of 50,000 shares at $1.00 per share non-assessable. Of this 34,500 shares have been sold, and as occurs a great many times with new companies, we had a tying up of stock for some time, and after investigation the Railroad Commission granted us permission to sell $10,000 or 10,000 shares on Dec. 3 1,1920, still leaving 5,500 shares in escrow until a 3% dividend is declared. This stock was in shape to sell after Jan. 25, 1921. The plant is now completed and will be ready to work as soon as weather permits to wash material.

The Pioneer Sand & Gravel Co., Leary Bldg., Seattle, Wash., has practically completed a deal for the purchase of the gravel pit of the Central Sand & Gravel Co., located midway between Three Tree Point and Alki Point, Wash. The deal involves a 40-acre pit, bunkers with a capacity of 1200 cubic yards, hydraulic pumps for sluicing, docks and other equipment necessary in the operation of an industry of this nature. The Pioneer Co., which is officered by H. F. Ostrander, president, and D. L. Williams, vice-president and general manager, is one of the largest sand and gravel producing companies in the Northwest. The company owns and operates the largest pit in this section, located near Steilacoom. This pit has a daily capacity of 4000 cubic yards for a 10-hour shift. With the addition of the pit to be acquired from the Central Sand & Gravel Co., the company's daily capacity will be increased to 5000 cubic yards for a shift of 10 hours.

Concrete Products

The Wilson Concrete Co., of which C. E. Wilson is secretary, is about to erect a business building in Red Oak, Ia.

The Concrete Products Co., Wheeling, W. Va., manufacturers of concrete blocks, has decided to add two rooms to its plant.

The **Concrete Products Co.**, LaGrange, Mo., has started operating to fill an order for cement drain tile.

The **B.-J. Concrete Products Co.**, Red Oak, Ia., will erect a building in which it will manufacture burial vaults. Ralph Jackson is secretary.

The **Roanoke Cement Tiling & Roofing Co.**, Roanoke, Va., will rebuild the portion of the plant which was damaged by storm to the amount of $9,000.

The **Miami Block Co.**, Miami, Fla., has been organized and incorporated for $100,000 to manufacture concrete blocks and building materials and supplies. Officers named are Hugh M. Anderson, president; V. J. Riley, vice-president, and R. B. Leonard, secretary and treasurer.

The **Maryland Concrete Corp.**, 700 Equitable Bldg., Baltimore, Md., recently organized, has taken over the plant and business of the Maryland Concrete Products Co., at Lansdowne, Md., purchasing at the same time large additional property adjoining the works. It is proposed to build a new plant on the site, 60x100 ft., for the manufacture of cement bricks and blocks; the combined plant will have a capacity of about 10,000 bricks and 1,000 blocks per day.

Mobile, Ala.—Concrete roofing tile is to be manufactured by a new company recently formed as a partnership at Mobile, Ala., by Enos Baldwin, of Indianapolis, Ind., and Clayton C. Baldwin and Miss Ellen Jardine, of Fairhope, Ala. H. S. Hanson, who has been connected with the tile manufacturing industry for the past forty years, is also affiliated with the company. A building has been leased in Mobile and the factory will start with an initial capacity of 1,800 tiles daily. Enos Baldwin is acting as general manager of the plant.

Cement

The **Atlas Cement Co.** announces that it has closed its plants at Northampton, Pa., and Hudson, N. Y., temporarily.

The **Allentown Portland Cement Co.**, Allentown, Pa., will make repairs and improvements at its large mill at Evansville, Pa., and plans to place it in operation at an early date.

The **Atlas Portland Cement Co.**, has leased the entire fourteenth floor of the new Cunard Building, 25 Broadway, New York City, for a period of 21 years, at an aggregate rental of approximately $2,000,000.

The **Dewey Portland Cement Co.**, of Dewey, Okla., has been closed down for repairs which will take a couple of months. The bins are reported to be full enough to take care of all orders for that period.

The **Empire Cement & Limestone Co.** of Portland, Ga., has sold out to the Nicholson interests and it is now being operated as the Georgia Cement & Stone Company. The new company will put in a large crusher and operate on a large scale, both for cement and commercial business.

Denison, Texas—Prof. W. S. Adkins, associate geologist, from the University of Texas is making a survey for the Denison Chamber of Commerce of cement deposits nead Denison, and should the report be favorable as to raw materials, likely a company will be organized to put in a cement plant.

Monolith, Cal.—After nearly two months' inactivity, the Monolith plant of the United States Potash Co., began operations Feb. 15. Within a week a full force was at work. The plant, which is located at Monolith, was formerly operated by the city of Los Angeles as a cement plant. It closed down when the rainy season began.

The **Superior Building & Supply Co.** will erect a warehouse and office in South Charleston, W. Va.

The **Lehigh Portland Cement Co.** has resumed work at the Fogelsville and West Copley mills. The 800 men will work full time at wages fixed Jannary 1. The Armrod plant of the company will resume operations shortly.

The **National Cement Co.**, Ragland, Ala., is preparing to abandon their old quarry and Bucket Lime plant. They have built a standard gauge road to their Collins Springs property and will open a steam shovel quarry there. They have also installed a large jaw crusher near their stock house and will soon be able to increase their output.

Gypsum Products

The **Victor Plaster Co.**, Rochester, N. Y., recently organized with a capital of $250,000, is planning for the development of gypsum properties at Victor, N. Y. Plans are under way for the erection of a new plant. The company's property is estimated to contain about 4,500,000 tons of gypsum. Carl A. Huber is president and Alvin H. Dewey, secretary.

The **American Gypsum Co.**, Port Clinton, O., at the annual meeting elected the following: J. H. McCrady, Braddock, Pa., president; F. J. Griswold, Port Clinton, vice-president; J. B. Davis, Cleveland, secretary and treasurer; P. K. Tadsen, Port Clinton; Ed McCrady, Braddock, Pa.; Harry Benne, Keysport, Pa., and Charles Miller, Cleveland. The above officers as named were elected at a meeting of the directors. The company announced that during the past year it had established mixing plants at Cleveland and Detroit. Prospects are for a good year.

Lime

The **Lowry Lime Co.**, Lowry, Va., has been organized by T. C. Kincannon, A. R. Hudson and J. C. Krautz.

The **Ohio Hydrate and Supply Co.**, Woodville, O., announce that they have decided to double the capacity of their plant by adding twelve kilns, which will give them an output of from 400 to 500 tons finishing hydrated lime per day.

The **Longview Lime Co.**, who operate a quarry at Saginaw, Ala., has electrified their plants under the direction of their new superintendent, H. G. Bridgewater, and also made extensive improvements on both their lime plants, and are now operating on an increased output.

The **Western Lime and Cement Co.**, Milwaukee, Wis., officially announces the consolidation of the Western Lime and Cement Co., Nast Bros. Lime and Stone Co., Union Lime Co., and Empire Lime and Stone Co., under the name of "The Western Lime and Cement Co." The company deals in all building materials.

Retail Dealers

Jack Martin Fuel and Supply Co., Kenosha, Wis., has changed its name to Superior Fuel and Supply Co. The company deals in all building materials.

Fischer Building Supply Co., Green Bay Road, Milwaukee, Wis., has reduced its number of directors from 5 to 3. The company is incorporated for $25,000 and deals in all building materials.

The **Forrer Lime and Cement Co.**, 421 Third St., Milwaukee, Wis., has changed its name to Forrer-Pipkorn Co. The company deals in lime, cement, plaster, etc.

The **Southwell Builders Supply Co.**, Fort Worth, Tex., of which L. C. Malone is secretary and treasurer, will erect a warehouse and office building at Jennings avenue and Jarvis street, to cost $20,000.

The **Massachusetts Lime & Cement Co.**, 379 Portland St., Cambridge, Mass., has construction under way on a new building adjoining its present plant, 250x250 ft., to cost about $30,000. It will be used in connection with general operations.

Personals

Charles L. Hogan, Kansas City, Mo., has resigned his position as secretary and treasurer of the Hogan-Sullivan Motor Co., 3107 Gillham Road, to become general manager of the International Cement Co., Havana, Cuba. Mr. Hogan will leave at once to assume his new duties.

H. M. Lee, president of the Duplex Truck Co., of Lansing, Mich., recently announced the appointment of Frank B. Willis as sales manager. Willis was formerly sales manager of the Kelley Springfield Truck Co., and has had a long and well seasoned truck training. In making this announcement Mr. Lee stated, "It is our intention to build one of the strongest and most capable truck organizations in the industry. The truck business is just coming into its own and those manufacturers who get themselves in the position of being able to do an intelligent job are those who will reap the benefits. For several years we have been building both a product and a personnel which in our estimation is far in advance of the times. By such methods, and only by such methods, can a manufacturer expect to properly serve the public and securely support his dealer organization."

George J. Blanton, who for the past four years has been connected with the engineering sales department of Chain Belt Co., Milwaukee, has been made New York District Manager. Before joining this company in 1917, Mr. Blanton was associated with the General Electric Co. for eight years, three years of which were spent in Schenectady, New York, and the other five in the Milwaukee office. Mr. Blanton has had a broad experience in engineering sales work and has comprehensive practical knowledge of the chain industry. Since Mr. Blanton has been with Chain Belt Co. he has figured prominently in the largest installation of traveling water screens yet on record besides various conveying installations all over the country. Mr. Blanton is a graduate of the University of Michigan, Department of Mechanical and Electrical Engineering, class 1909. He will leave immediately to take charge of the company's offices at 50 Church Street, New York City.

OBITUARY

Walter Casada, 26 years old, was fatally injured at the P. M. and B. quarry at Bedford, Feb. 12, when a huge stone that was being turned fell, fracturing his skull and injuring him internally. He died a short time later. He was a veteran of the world war, and participated in battles at Meaux, Aisne, Vista, Toul, St. Mihiel, Meuse and Argonne with Company D, 58th regiment, 4th division. He is survived by the widow and four small children.

ANCHOR BRAND COLORS

For Mortar, Cement and Brick—Brown, Black, Red and Buff —Strongest and Most Durable

Manufactured by

C. K. Williams & Co.

Correspondence Solicited **EASTON, PA., U. S. A.**

The Advance Engineering Company
Cleveland, Ohio
The "ADEN" Crane and Bucket
Special Interest to Sewer Contractors and Special Excavation Problems

E. 140 St. Sewer, Cleveland, O.—34 Yd. Heavy Bucket being used

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. please send check with your order. These ads must be paid in advance of insertion.

Equipment for Sale

Sauerman Dragline Excavator Outfit Complete, Including

1—100-ft. Lattice Steel Tower.
1—1½-yd. Bucket and Carrier, with extra new bottom; never been used.
900 ft. 1⅜ Track Cable, good condition.
850 ft. ¾ Hauling Cable in good condition.
1—Thomas Elevator Co. Double Drum Two Speed Hoisting Engine.
1—100-H.P. Alternating Current Motor.

All in good working condition. Hoisting Engine practically good as new. Located in Erie, Pennsylvania. Also one Besser Concrete Block Machine. For particulars, address

DOWNING GRAVEL PIT
1117 State Street **Erie, Pennsylvania**

FOR SALE

Sand and Gravel Pumping outfit complete, consisting of 10-inch Morris Pump, direct connected to double 9x9 engines, Scotch Marine Boiler, 250 H.P. McMyler Whirley 50-ft. boom, 1-yd. Owen bucket. Have installed electric outfit.

M. A. CALLAHAN
"THE SAND MAN"
Schofield Bldg. **Cleveland, Ohio**

FOR SALE

2—No. 18 Gates K Gyratory Crushers with elevators and screen; complete; first class; immediate delivery. Also twenty other sizes.

J. F. DONAHOO CO.
Birmingham, Ala.

FOR SALE

One second hand No. 5 Good Roads Crusher, with opening 11"x26", in excellent condition; a real bargain to a quick buyer. Address

Box 1453 **Care of Rock Products**

FOR SALE

FULLER MILL, 42" Standard, fan discharge, belt driven type. Practically new, immediate delivery. LOCOMOTIVE, 18 ton, 10x16 Porter 36" gauge saddle tank in good operative condition. Address

Box 1450 **Care of Rock Products**

FOR SALE

Millions of tons of tailings or limestone gravel—a by-product of the zinc mines. Immediate delivery at rate of ten cars per day.

WISCONSIN ZINC COMPANY
B. P. Larkin, Agent **Benton, Wis.**

FOR SALE

9x16" Climax Jaw Crusher mounted on I-beams and trucks.
No. 2 Style D. Gates Gyratory Crusher.
75 H.P. 13" bore by 16" stroke, side crank Erie City Steam Engine.
125 H.P. 18" bore by 24" stroke, side crank Atlas Steam Engine. Shop No. 25197.
12x12" Lidgerwood Standard, double cylinder, 2 drum cableway engine.
600 lineal feet 1¾" Roebling Wire Cable—never used.
100—H.P. Motor; 100 K.W. Generator, 60 cycles, 550 volts, maker Fairbanks & Morse. Both new. Address.

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Boiler and Hoist Wanted

Locomotive type boiler and 9x10 D. D. D. C. Skeleton Hoist. Give complete description and price.

O'KEEFE & THOMSON
GENERAL CONTRACTORS
Plymouth, Indiana

Locomotives for Rent or Sale

2—50-ton 18x24 in. six-wheel switchers.
1—40-ton 17x24 in. four-wheel switcher.
1—40-ton Vulcan four-driver saddle-tank.
2—18-ton and 14-ton 36-in. gauge Vulcans.
2—10-ton 7x12 in. 36-in. gauge Vulcans.
1—10-ton 36-in. gauge Shay geared.

Miscellaneous

1—Marion 35 steam shovel on traction wheels.
1—Marion 76 steam shovel, No. 3503.
1—Lidgerwood dragline, 60-ft. boom, 2-yd. bucket.
100—60,000-lb. capacity box cars, 40-ft. long.
40—60,000-lb. capacity flat cars, 36-ft. long.
13—6-yd. dump cars, 4-ft. 8½-in. gauge.
12—1½-yd. "V" steel dump cars, 36-in. gauge.
1—Western standard gauge spreader.
2-in., 4-in., and 6-in. simple, duplex, and centrifugal pumps, 10 H.P. and 45 H.P. upright boilers, tripod drills, etc.
LOCOMOTIVE CRANES, RAILWAY EQUIPMENT, etc.

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All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

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To buy direct from owner, used Steam Shovel with ⅝- or ¾-yard dipper. State condition, lowest price and terms in first letter.

Watertown Stone Products Co., Inc.
Watertown, N. Y.

FOR SALE

2—13-ton Standard-gauge Whitcomb Gasoline Locomotives.
1—Class "G" Ingersoll-Rand Air Compressor, 925-ft.
1—Class "H" Ingersoll-Rand Air Compressor, 342-ft.
1—Aerial Tramway System, 1100-ft. centers, with 12 buckets and carriers, 2650 ft. ¾ in. pulling cable, with 1¾ in. and 1¼ in. carrying cable, with sheaves, counterweight equipment, 65 H. P. motor and speed reduction gears complete.

THE CASPARIS STONE CO.
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Immediate Delivery

18—8 & 9 K Crushers, Reg. Drive

2—150-H.P., 125-lb. Marine type boilers.
2—150-H.P. 125-lb. H.R.T. boilers, buttstrap.
4—No. 6 Gates (Mang. Fit.) nickel steel shafts.
1—No. 7½ & 1—No. 8 Gates reg. drive.
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Air Compressors (steam-belt) 50 to 4000 ft.
40 Boilers, 60-150 H.P., 100-130-lb.
25—60 & 100 H.P. Ver. Boilers.
4—NEW No. 4 Gates, Mang. Fit., $1750 ea.
1—No. 16 Koehring Paver, ½-yd., steam.
1—8x8 and 10x10 Air Comp. (belt).
2—180-ft. Quick Shift, 30-ft. bucket towers.
2—156 Kva. 240 V. 60 Cy. 3 Ph. Eng. Sets.
50 Kw. 125 V. Dir. Cur. Eng. Set, $800.

Send us your inquiries—Pumps, Steam and Electric Equipment, etc.

ROSS POWER EQUIP. CO.
INDIANAPOLIS, IND.

WANTED

No. 5 McCully Crusher, standard discharge, give full particulars.

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152 Temple St., New Haven, Conn.

WANTED

Second-hand 42" Fuller Mill, Fan Discharge, Type 1917-1919.

Security Cement & Lime Co.
Hagerstown, Md.

WANTED

Second hand grinding mills, Griffin type preferred; also a good crusher of the Pan type. Address

Box 1475 **Care of Rock Products**

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who'll keep it going.

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Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

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8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
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1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

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1—1¼-yard Williams Hercules Bucket.

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30—Western Air Dump 12-yard, standard gauge.
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DRYERS—Direct-heat rotary dryers, 3x25′, 3½x25′, 4x30′, 5½x50′ 6x50′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

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MILLS—6x8′, 6x5′, 2½x3" 3x3½′ pebble and ball mills; 8x4′, 6x4′ and 4x4′ continuous ball mills; 3′ March mill; 42", 33" and 24" Fuller-Lehigh mills; **4½x20′, 5x11′, 5x20′, 5½x22′ and** 6x20′ tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer **mills; one Kent type "G" mill; 36" and** 40" cage mills; 3′ and 4½′ Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 **Sturtevant ring roll crusher; 3 roll and** No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens, Richardson **automatic scales.**

Air compressors and tanks.

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1—3-ton, 4-ft. 8½-in. gauge Plymouth Gasoline Locomotive.
1—7x10 cyl. 36-in. gauge Vulcan Saddle Tank.
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4—2-yd. 36-in. gauge Easton "V" dump cars.
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5—30-ft. steel underframe side dump ballast cars.
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"Everything for the Quarry"

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75-H.P. A.C. low speed, heavy duty, slip ring, 3-phase, 60 Cycle, 220/440 Volts, electric motor, with Starter and Slide rail new or used. Give full particulars and spot cash price.

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Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

1 New, Manganese head.
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We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

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Plants for Sale

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Splendid opening for experienced superintendent. Controlling interest in a going, old established lime manufacturing and stone crushing plant doing nice business. Attractively located, central Ohio. Controlling stock interest in $50,000 incorporated company assures good position with salary. Stock can be purchased on liberal terms with best of banking connections. Will bear close investigation. No trifler need apply. Address

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Unlimited quantity of limestone available. Between 50,000 and 60,000 yards already quarried, of which large part is ready for crusher. Very little stripping required in quarry.

Three boilers, two steam hoisters and rails suitable for switches are also available.

A fine proposition for crushing plant or cement manufacturing. Address

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a sand and gravel bed that I own on the R. R., with two large cities within 75 miles of the property, where I own a large deposit of good, clean, coarse sand and gravel, with plenty of water and a good gas well and 3 to 3½ foot seam of good clean coal right at the sand bed where I can furnish the cheapest power and fuel that can be gotten for manufacturing purposes. For further particulars address

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Crushing and Pulverized stone plant consisting of about 30 acres of stone land with No. 5½ Gates Crusher and No. 3 Gates Crusher and one Sturtevant Pulverizer with all necessary machinery and equipment, including 100 horsepower boiler and engine; all machinery in A-1 condition. Pulverized limestone for agricultural purposes one of the main industries. Buildings all new. Shipping facilities splendid.

Call on or address

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POSITION WANTED

As manager or superintendent by a wide-awake man of over 20 years' active experience in the installation, development and operation of quarrying and mining plants. Can produce results at low cost. Highest references. Can speak Spanish. Salary with bonus preferred.

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WANTED

Position as quarry superintendent. Experienced in both Limestone and Trap Rock quarrying also mine stripping. Fifteen years' experience in handling drilling and blasting, steam and electric shovels, locomotives, crushing and screening, and power plants. Have also had experience on steel and concrete construction work. References furnished. Address

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Operator or executive of large quarry, lime or gravel plant. Qualified for general superintendent or general manager. 15 years' actual experience in construction, steam shovel work, drills, explosives and heavy machinery. Associate member American Society Civil Engineers; age 36; unmarried; salary or salary and bonus, minimum $5000 a year. References and interview. Address

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Superintendent desires engagement where thorough knowledge of steam shovel operation, transportation, heavy blasting and operation in detail are essential to production. Excellent reference. Address

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Experienced Quarry Operator

Is desirous of getting in touch with financial parties with object of opening stone crushing plant in locality where large business is assured. Can guarantee success. Address

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Experienced Shovel Runner for 70 ton Bucyrus quarry shovel, steady employment. Address

Box 1474 **Care of Rock Products**

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Opening up and economical development of stone quarries, sand, gravel and clay deposits.
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Most suitable machinery and methods to insure lowest costs.
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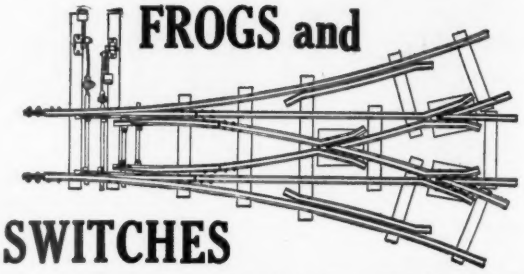

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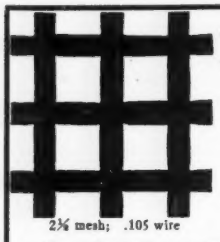
A uniform fineness is assured by its use



2½ mesh; .105 wire

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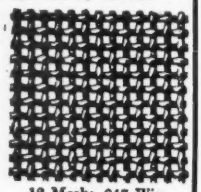

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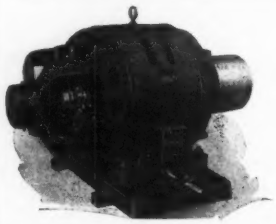

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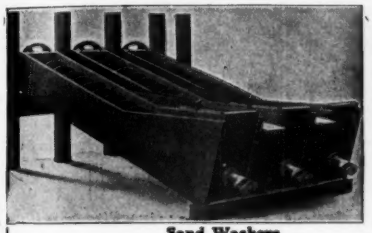
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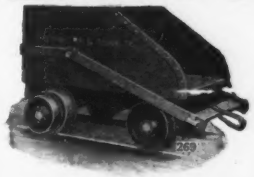

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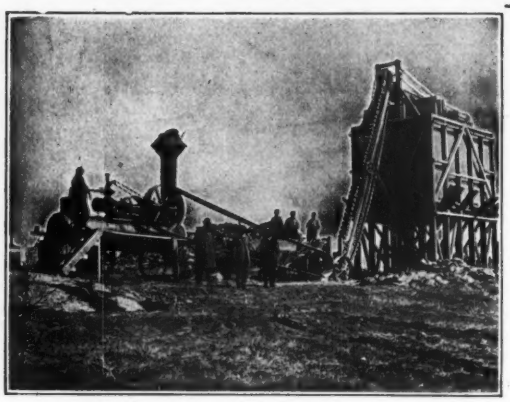

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dig, convey, elevate and dump in one operation

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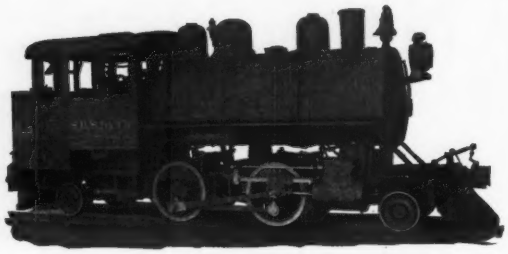

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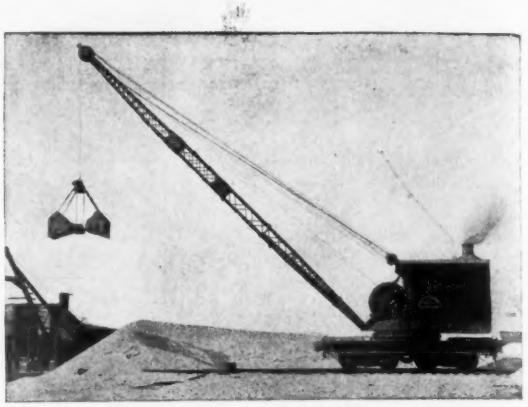

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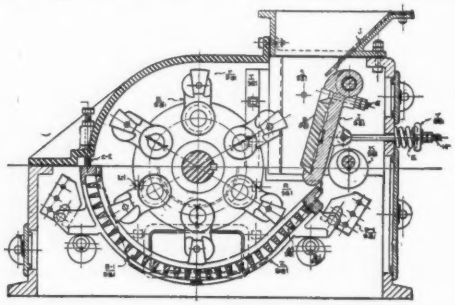
insure satisfaction wherever installed. Correct design, best of materials used with superior fabrication. Catalog No. 18 contains valuable information and is mailed upon application.

Orton & Steinbrenner Co.
Chicago, Ill.
Factory—Huntington, Ind.

THE KENNEDY
Swing-Hammer Pulverizer

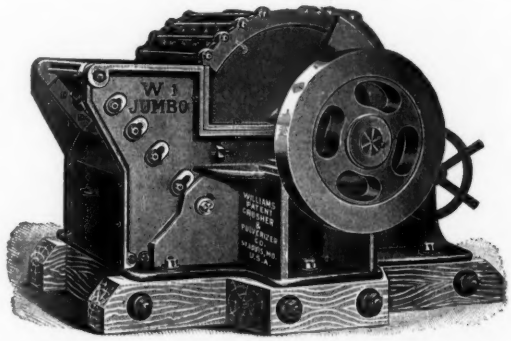


A Mechanically Perfect Device

The Kennedy Swing-Hammer Pulverizer embodies mechanical improvements heretofore considered unattainable. Reversible, renewable hammer tips and breaker plates of alloy steel. Impact pulverizing—no grinding movement. Adjustable steel grid—so controlled as to permit adjustment while machine is running. Automatic lubrication. Ball and socket bearings—in short, every possible improvement tending toward efficiency, durability and low maintenance expense.

Send for full description

Kennedy Van Saun Mfg. & Eng. Corp.
120 Broadway **New York**
Compagnie des Entreprises Industrielles, 40 Rue Des Mathurins, Paris, France



Williams Crushers

Williams Jumbo Crushers are used in quarries as secondary crushers, taking 10-inch and under limestone, as it comes from the primary crushers, and reducing the material to 1½-inch, 1¼-inch or 1-inch and under in one operation. These machines are built in capacities ranging from 30 tons to 300 tons per hour. Many are now in operation. Complete details concerning these crushers are found in bulletin No. 4-B.

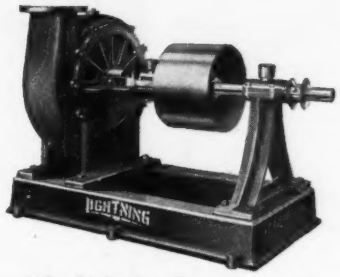
WILLIAMS PATENT CRUSHER AND PULVERIZER COMPANY ESTABLISHED 1871

PLANT & OFFICES 2701-N. BROADWAY ST. LOUIS, MO.
GENERAL SALES OFFICES 37 W. VAN BURAN STREET Chicago, Ill.
WESTERN OFFICE 67 SECOND ST. SAN FRANCISCO, CALIF.

The Lightning Sand Pump

Is No Loafer!

Operate like a flash! Adjusts in a flash! Parts replaced like a flash!

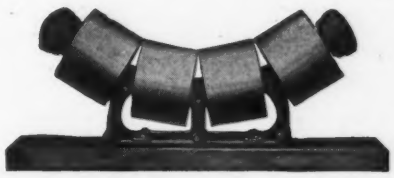


The life of the Lightning Pump is one long, unbroken streak of production.

Simple in design and construction.
Drum removable and adjustable to any position.
Drum plate quickly removable.
Ball thrust bearings, front and rear.
Chilled bumper in sand drum provides long wear.
Bumper quickly replaced.
Detailed description with prices on application.

Address Pump Dept.

Kansas City Hay Press & Tractor Co.
Kansas City, Mo.



CALDWELL Belt Conveyors

Simple—Economical

will solve your handling problem. Simple in design, economical of power, they give the utmost satisfaction. Our forty years' experience has made us thoroughly familiar with the many details of construction necessary to success.

A rough sketch showing the conditions to be met at your plant will bring our recommendations. We should also know the capacity desired and the power available.

Get Catalog No. 38

H. W. Caldwell & Son Co.

Elevating, Conveying and Power Transmitting Machinery

Chicago 17th Street and Western Avenue

50 Church Street New York, N. Y.

Universal Crushers

The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy!
Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

Universal Crusher Co.
225 Third Street
Cedar Rapids, Iowa, U.S.A

Ask for Folder 1918

"Perfect" Concrete Brick Power Machine

Also Hand and Power Block Machines

Hand Brick Machines

Well, Cistern and Silo Molds

C. S. WERT—Inventor and Patentee

Turns out, with four men, 16,000 to 20,000 concrete bricks in ten hours.

In severe tests, **Perfect** Concrete Brick have proven stronger than common clay and pressed clay brick.

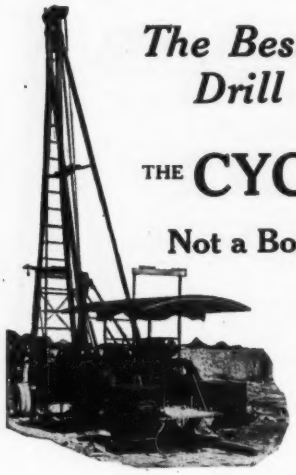
The power tamper may be operated by a one horse power motor, a 2½ horse power gas engine or direct from a line shaft.

"There is no better brick machine manufactured," says W. T. Sharp, of Montana, owner of a **Perfect** brick plant.

Get facts and figures now. Write while the matter is on your mind.

Latest Model, Gearless and Noiseless

Manufactured by
The Wert Mfg. Co.
2547 Railway Exchange Bldg.
Chicago



The Best Blast-Hole Drill on Earth

THE **CYCLONE** No. 14

Not a Boast—A FACT

We will prove the superiority of the No. 14 Drill by placing one of the outfits in your quarry against any or all other makes.

If the Cyclone doesn't out-drill and out-wear all other drills, we will remove it from the work without cost to you.

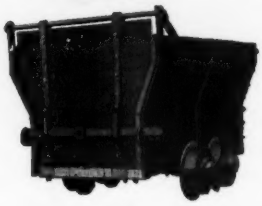
Our proposition gets below the paint—it eliminates talking points and evaporates hot air. It puts buying on a strictly engineering basis where it belongs.

Furnished in Steam, Gasoline, Compressed Air or Electric Power Traction or Non-Traction

Let us send you full particulars

The Sanderson-Cyclone Drill Co.
ORRVILLE, OHIO
Eastern and Export Office 30 Church St., New York

WATT CARS



Our factory the largest in the world devoted exclusively to car building

Write today for catalog

The Watt Mining Car Wheel Co.
Barnesville, Ohio

Denver: Lindrooth, Shubart & Co., Boston Bldg.
San Francisco: N. D. Phelps, Sheldon Bldg.
Philadelphia: Edelin & Co., 235 Commercial Trust Bldg.

OSGOOD 29 1YD TRACTION REVOLVING STEAM SHOVEL

Whether it is to meet the requirements of quarry work where the largest crushers are used, for handling ores where large capacity is required, for excavating shale, etc., without blasting or for the general every day use in construction work, you buy the greatest amount of satisfaction in every way when you buy an OSGOOD—Large or Small.

We willingly help you solve your excavating problems in a way that will materially reduce yardage cost.

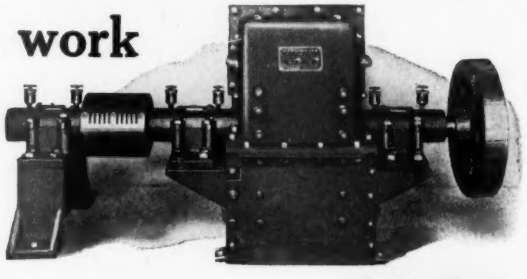
Write today for copy of our General Catalog C-1.

Revolving and railroad type ¾ to 6 cu. yds.

The **OSGOOD** COMPANY
MARION, OHIO

By the very nature of the work

it is called upon to perform a pulverizer must be much stronger than the material it handles.



Only STEEL will stand the stress

"K-B" is built ALL-Steel

Catalog with full particulars on request

K-B PULVERIZER COMPANY, Inc., 92 Lafayette St. NEW YORK

K-B PULVERIZER

Many Notable Improvements Characterize THE "American" Gearless Blast-Hole Drill

While the normal speed of drilling is 50 strokes a minute, this machine will jump the tools smoothly at 60 strokes, handling with ease a 4-in. diameter by 20-ft. length drill stem equipped with bit and socket weighing from 1100 to 1200 lbs. and drilling 5¾-in. or 6-in. holes.

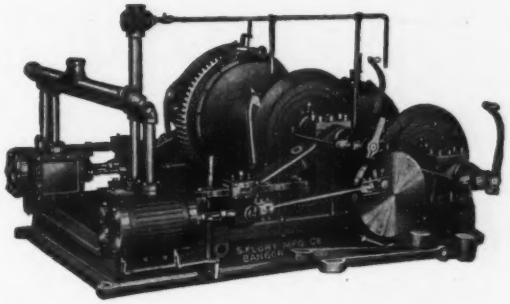
The spudding beam is attached to the crank in such manner that it gives a quick, hard stroke of drill at a speed of 50 or 60 r. p. m., with a minimum of whipping of cable.

No clutches on the machine; the crank is keyed fast to the crank shaft, and the tools are always the full length of the stroke off the bottom when stopping, permitting them to start on the down stroke with engine or motor at full speed without backing up.

Description on Request

The American Well Works Aurora, Illinois

FLORY HOISTS



Double Friction Drum, Steam Hoist for Derrick Work. One of the many types illustrated in the Flory Catalog. Sent on request.

A FLORY HOIST FOR EVERY PURPOSE

Hoists—Cableways—Derricks

S. Flory Manufacturing Co.

Bangor, Pennsylvania

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Chicago: Monadnock Block Hartford: K. B. Noble Co.
Birmingham, Ala.: Chas. T. Lehman

The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

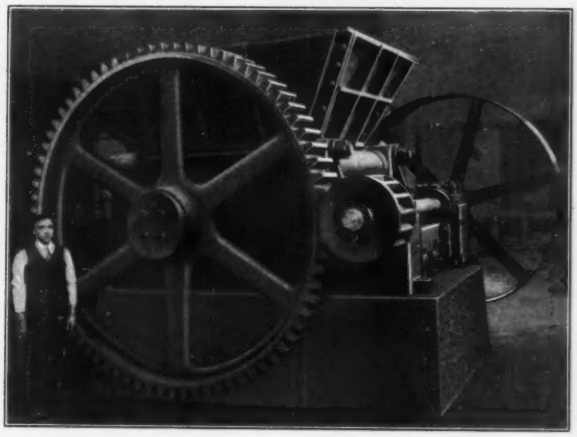
Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

Send for Catalog

H. MISCAMPBELL

Patentee and Sole Manufacturer

DULUTH - - MINNESOTA



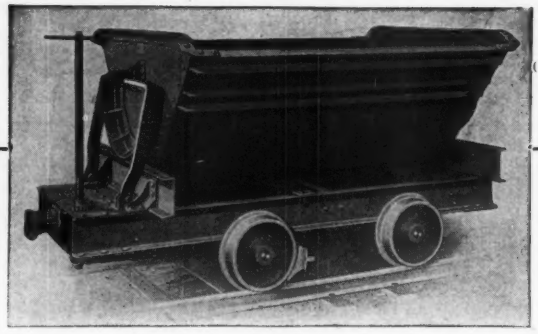
If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, etc.



More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.

Perforated Metal Screens
FOR
Stone, Gravel, Sand, Etc.

ELEVATOR BUCKETS
PLAIN AND PERFORATED
General Sheet and Light Structural Work
Hendrick Mfg. Co.
CARBONDALE, PA.
New York Office, 30 Church Street
Pittsburgh Office, 915 Union Bank Bldg.
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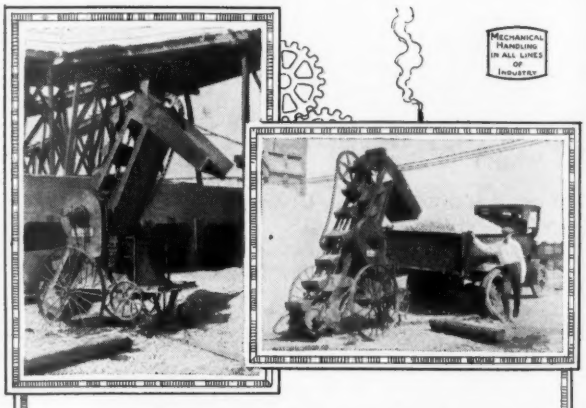
BUILDERS OF
THE "ARNOLD"
LIME KILN AND
LINING

LOCATED
IN THIS DISTRICT

ARNOLD & WEIGEL
CONTRACTORS AND ENGINEERS
WOODVILLE, OHIO



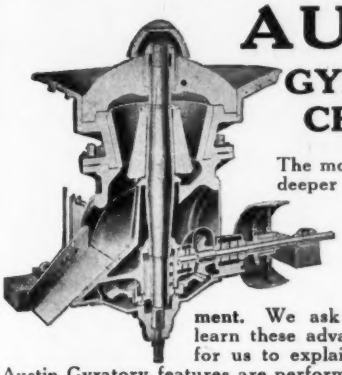
GIFFORD-WOOD Wagon Loaders handle loose materials of all kinds at the lowest cost per ton. They have proven their efficiency and their serviceability.

If you are interested in Screens of any kind or Conveying Machinery write for our catalog, or better still, let us know your problem. We will gladly submit a plan.

Gifford-Wood Co.
NEW YORK CHICAGO MAIN OFFICE AND WORKS HUDSON, N.Y. BOSTON BUFFALO

AN INSIDE VIEW
Invites Your Study

We are anxious for you to know the internal construction of the



AUSTIN GYRATORY CRUSHER

The more you study it, the deeper you probe into the details of design, the more certainly will you be deeply convinced of the great advantages of **Austin Equipment.** We ask you to study and learn these advantages, rather than for us to explain them to you, for Austin Gyratory features are performance features—substantial mechanical advantages—not talking points.

There are eight sizes, ranging from 5 to 500 hourly capacity. Literature describing each model in detail ready for you.

Write today for Catalog 28

Austin Manufacturing Company

New York CHICAGO San Francisco

ERIE Steam-Shovel owned by Jackson-Bangor Slate Co., Pen Argyl, Pa.

"Very Economical"

"During the past year we have moved approximately 50,000 cu. yds. of slate shale with our ERIE Shovel. It is a wonderful machine, ideal for our work, as it is easily moved. We find it very economical and inexpensive. We are very much pleased with our investment." *N. M. Male, Sec'y, JACKSON-BANGOR SLATE CO., Pen Argyl, Pa.*

Serves as Steam-Shovel or Crane (Clamshell)

The ERIE Shovel is easy to operate, and very speedy. It is built with extra strength all the way through, and gives steady service in hard rock loading. Let us send you full details about the ERIE Shovel, and what it will do. Write for a copy of Bulletin P.

BALL ENGINE CO., Erie, Pa.
Builders of ERIE Steam-Shovels and Locomotive Cranes

ERIE Revolving Shovels BALL Engine Co. Erie, Pa.

CROSS ENGINEERING CO. CARBONDALE, PA. PERFORATED SHEET METALS

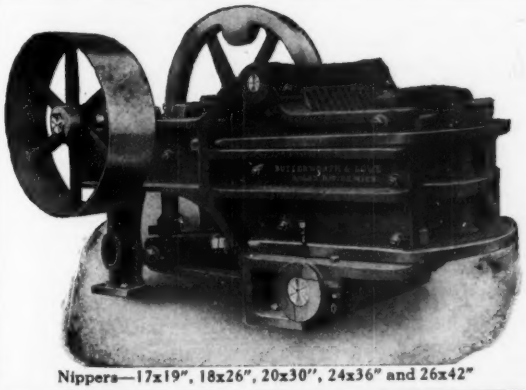
PERFORATED STEEL SCREENS

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge, and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pennsylvania



Nippers—17x19", 18x26", 20x30", 24x36" and 26x42"

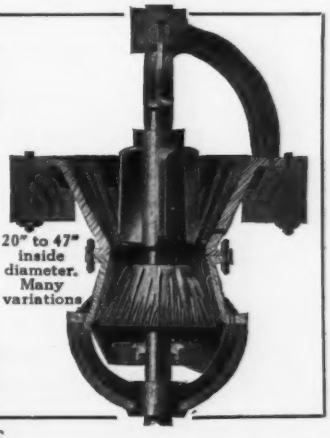
JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

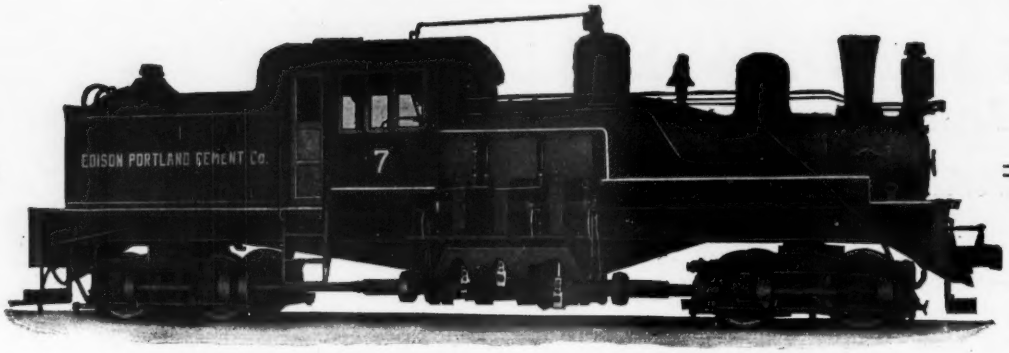
GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

Special Crusher-Grinders for Lime

Butterworth & Lowe
17 Huron St. Grand Rapids, Mich.



20" to 47" inside diameter. Many variations



60-TON SHAY ENGINE BUILT BY LIMA FOR EDISON PORTLAND CEMENT CO.

"Shays" in Quarry and Gravel Pit

Getting out rock and gravel is usually a crooked, rough track job.

The grades are winding and steep.

The flexible-geared drive of the "Shay" was designed for just such work.

Sharp curves and steep grades, where a rod engine would be helpless, are easy for a "Shay."

Multi-cylinder engines and every wheel a driving wheel gives a steady, powerful, even pull.

"Shays" do not cut down output by slipping and stalling.

LIMA LOCOMOTIVE WORKS, Inc.

LIMA, OHIO **30 Church St., New York**

BATES WIRE TIES

for tying reinforcement in concrete construction

Ties all kinds of reinforcement effectively —mesh, bars, metal lath, expanded metal. Also used in the manufacture of concrete pressure pipe and sewer pipe.

A handy tool which means efficiency and speed to the workman—a money saving device to the contractor.

Write for illustrated price list.

We also make the Bates Packer for packing cement, ground limestone, etc.

BATES VALVE BAG COMPANY
7310 South Chicago Avenue
CHICAGO, ILL.
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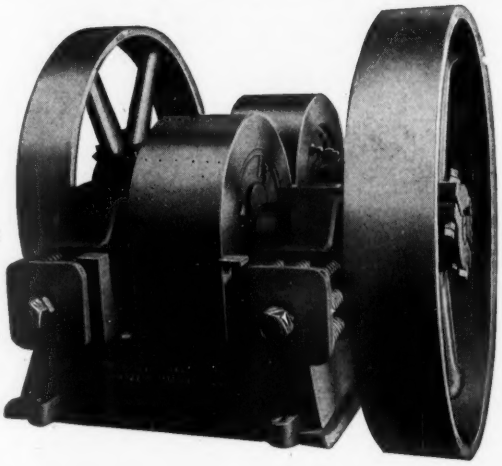


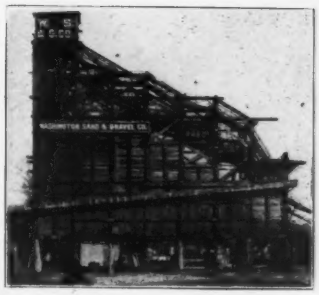
When you are in the market for Transmission Equipment, Screens, Elevator Buckets or Crushers, and want the best that can be had irrepective of price.

Write for Descriptive Literature

WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS
WEBB CITY, MISSOURI

Producing Sand and Gravel

We build the elevating, conveying and screening equipment you will need for producing washed sand and gravel. Our engineers will give careful consideration to your problem and submit appropriate suggestions for equipment to meet your needs.



Small washing and screening plant equipped complete with S-A machinery.

We Also Build

Feeders
Pan Conveyors
Bucket Elevators
Screens
Skip Hoists
Car Pullers
Friction Hoists
Coal Crushers
Portable Conveyors

SEND FOR CATALOG

When placing your order for screening equipment, standardize on the machinery built by S-A Engineers for this particular industry. S-A labor saving machinery possesses those features of design and construction which warrant standardization where reliable service is required.

STEPHENS-ADAMSON MFG. CO.

AURORA, ILLINOIS

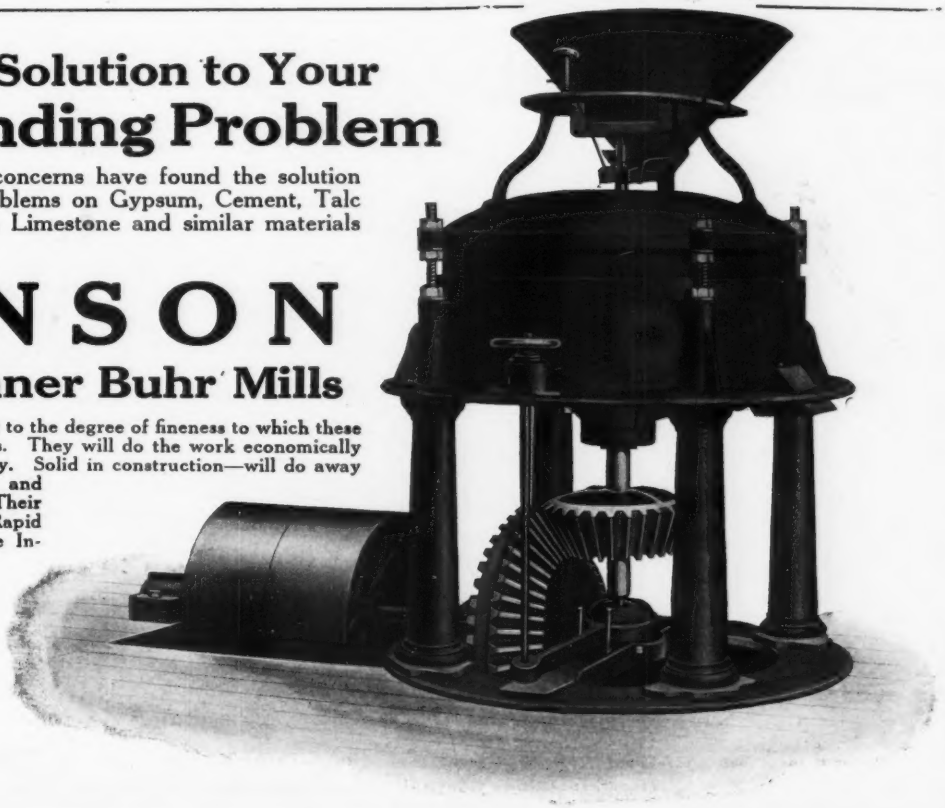
Here is the Solution to Your Fine Grinding Problem

Many of the leading concerns have found the solution to their fine grinding problems on Gypsum, Cement, Talc and Soapstone, Graphite, Limestone and similar materials by installing

MUNSON

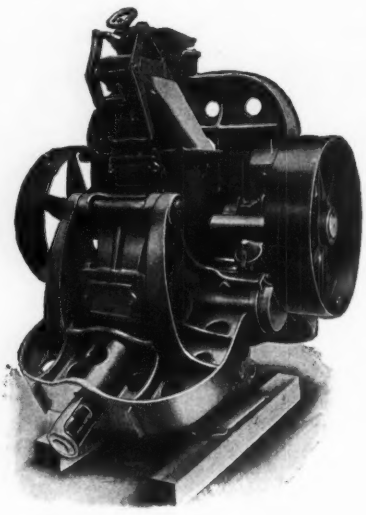
Under Runner Buhr Mills

There is practically no limit to the degree of fineness to which these mills will grind these products. They will do the work economically and satisfactorily in every way. Solid in construction—will do away with delays and shut-down and keep out of the repair shop. Their Automatic Adjustment, Rapid Grinding and Perfect Balance Insure good results and fine and uniform grinding.



Why not investigate? Send for our new catalog, number 71.

Munson Mill Machinery Co., Inc.
Utica, New York



MAXECON MILL

Preliminary Grinder for Tube Mills

LIMESTONE ..... 20 to 40 Mesh
CEMENT CLINKER ..... 20 to 60 Mesh

MAXECON MILL
PERFECTECON SEPARATOR

The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.

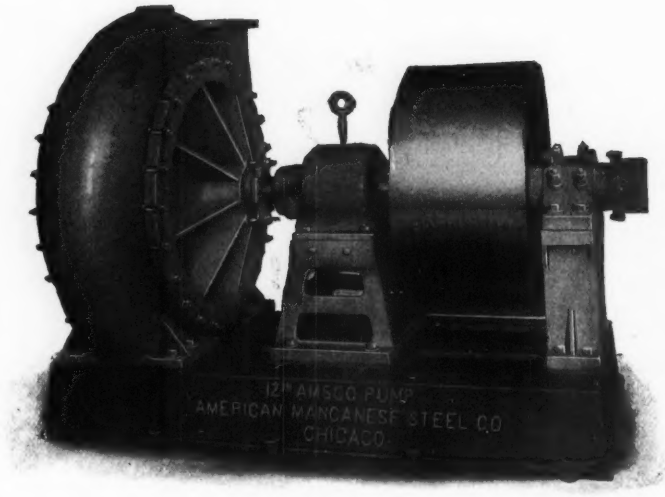
It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

Drop us a line **We will be glad to tell you about it**

Kent Mill Company

10 Rapelyea Street **BROOKLYN, N. Y.**

AMSCO SAND AND GRAVEL PUMPS



Are Dependable Producers

Save delays
More operating days
Lowest cost per yard pays

Built of rugged construction for hard service. Shell, side plates and runner—parts exposed to abrasive wear and constant grinding action—are made of manganese steel.

Extra heavy shaft, sturdy bearings, ball bearing thrust collar and well balanced runner, make the AMSCO pump a smooth-running and efficient machine.

AMSCO Flap Valves, Pipe and Elbows
Write for Pump Bulletin

American Manganese Steel Company

General Offices: 1872 McCormick Building, Chicago

Western Sales Office: Newhouse Bldg., Salt Lake City
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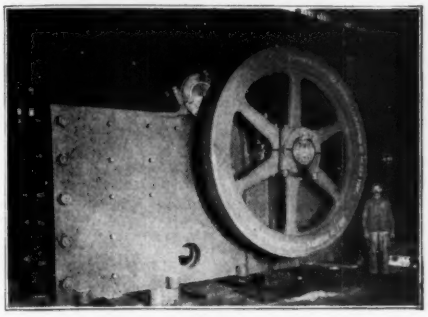


Dependable

You want the crusher that you can depend upon all the time. As a chain is no stronger than its weakest link, so a rock crusher is no stronger than its weakest part. There are no weak parts (except the safety toggle) in

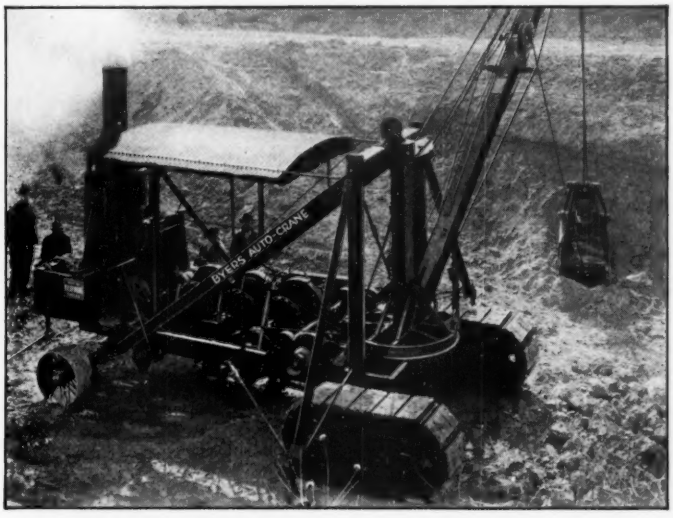
BUCHANAN ALL STEEL JAW CRUSHERS

The distinguishing features of Buchanan Jaw Crushers, Side Frames, Front and Rear Head, Pitman, Swing Jaw, and Toggles are made of the very best quality of heat treated and thoroughly annealed open hearth steel, and all joints under strain are carefully machined. This solid all steel construction makes them the choice where there is hard crushing work to be done. They will do your work satisfactorily and economically. Write for Bulletin No. 10.

C. G. BUCHANAN CO., Inc.

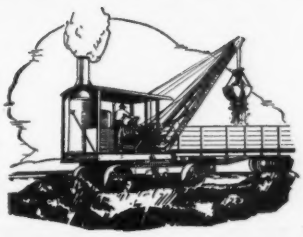
90 West Street **New York**

Crushing Machinery, Crushing Rolls and Magnetic Separators



GENERAL INFORMATION—BYERS CRANES, BOTH TYPES

Weight—Without bucket, 13 tons.
Power—Customer's choice of steam, gasoline or electricity.
Mounting—Customer's choice of broad tire road wheels, crawling traction trucks under one or both ends, or railroad wheels of any gauge.
Attachments—Can be used with clamshell, orange-peel or dragline bucket; hook, skip, magnet or other standard fittings.
Capacity—¾ yard clamshell for handling loose material; ⅛ yard clamshell, orange-peel or dragline for excavating; 5 tons for hook work.
Standard Boom Length—30 feet for bucket work—can furnish up to 40 feet for derrick work.



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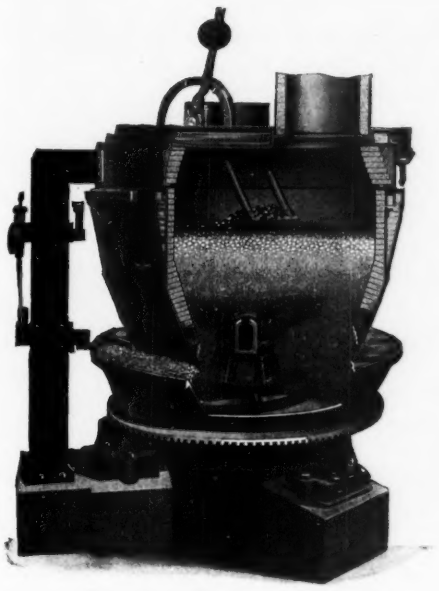

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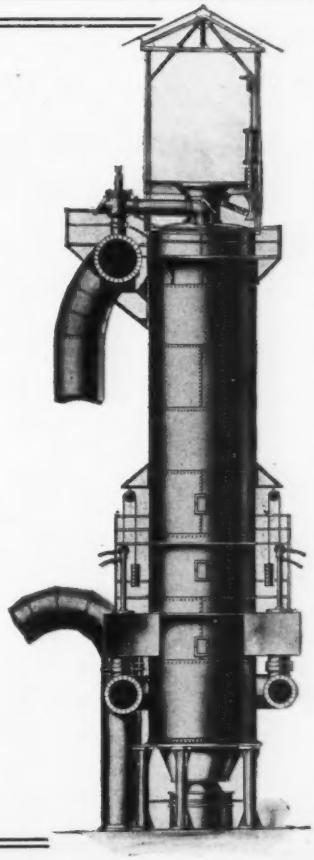

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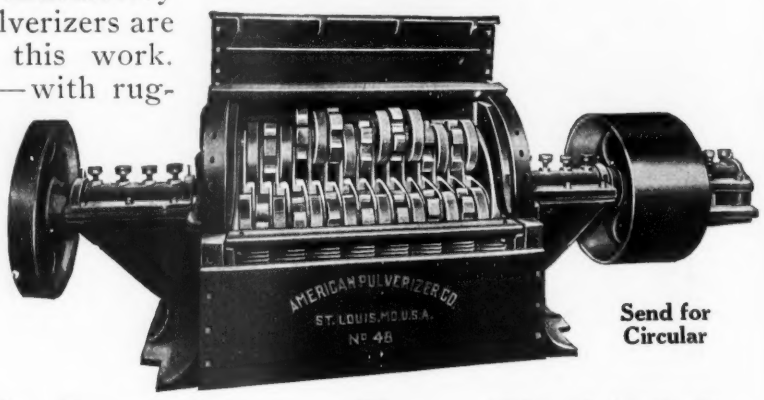

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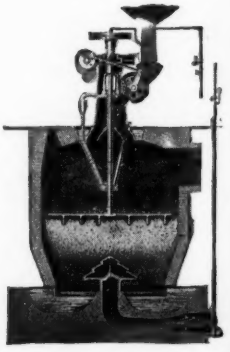

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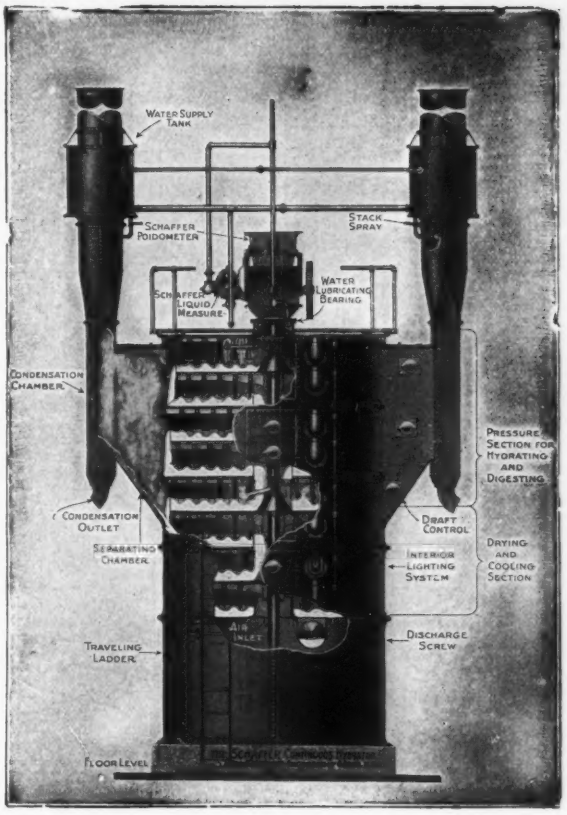

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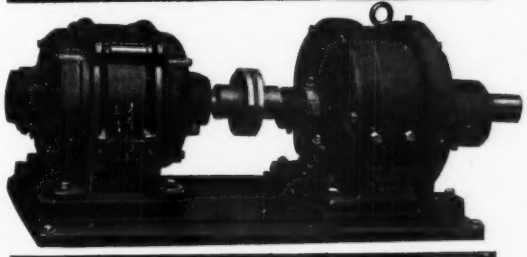

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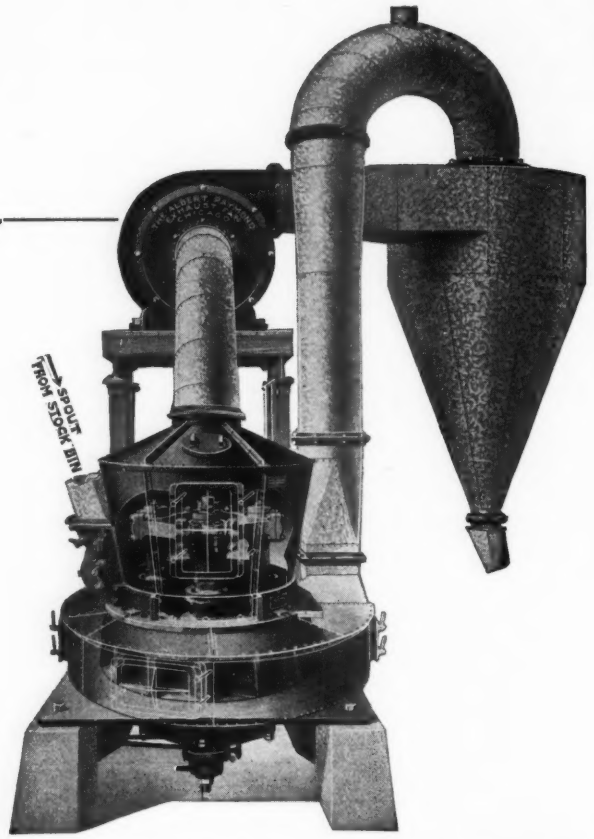

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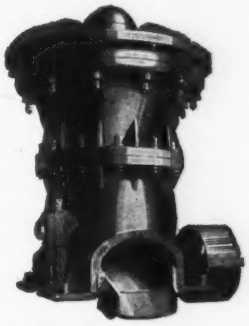

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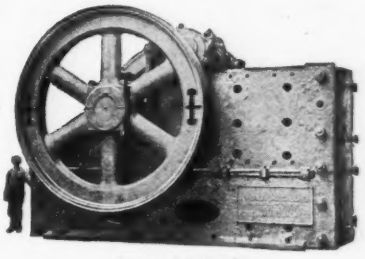

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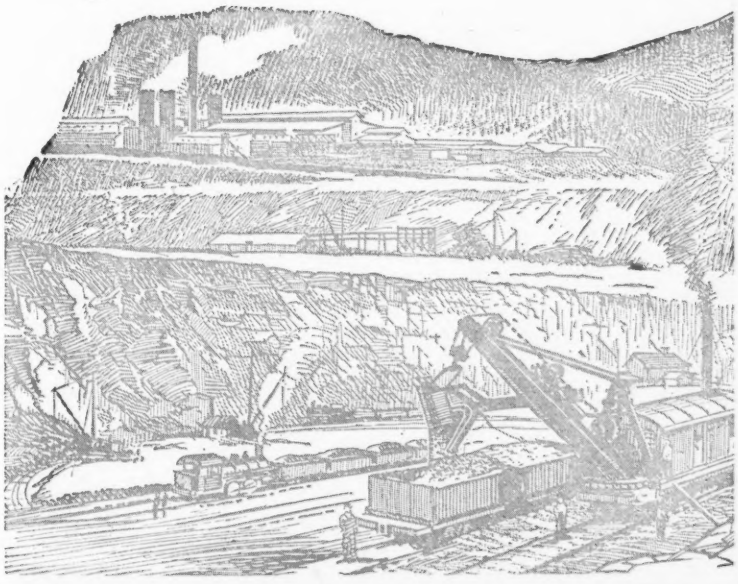

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